THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., APRIL 24, 1890.

THE WEEK IN IRON CIRCLES.

General Features. The sales books of furnace companies north of the Ohio River present an interesting study these days. It is estimated roughly that they show unfilled orders amounting to not less than 250,000 tons, while the aggregate of stocks on furnace banks will not reach one-fifth of this. Indeed, the surplus supply of the majority of plants, both North and South, which look to the open market, was, April 1st, less than two weeks' make. As near as can be ascertained the orders placed for Southern using during the past two weeks aggregate the largest tonnage ever recorded for an equal length of time. One company with four stacks has 35,000 tons sold ahead. Another large corporation has fully double that quantity. The situation, therefore, seems healthy from a Southern standpoint. The many rumors that have been afloat at Cincinnati, as to exceptionally low prices on Southern and other irons in recent sales, when traced down, have proved groundless. Extraordinary claims have been made by buyers as to what they could do in purchases but it is noted that they have been willing to put in heavy orders at schedule prices. The general indications of the Detroit market for the past week, as reported by W. F. Jarvis & Co., have pointed to greater strength, and showed that bottom prices had unqestionably been touched; and while this is the case, there were a sufficiet number of soft spots to enable some buyers to obtain some round lots at as low figures as have been made this year. This particularly applies to Southern coke irons. Southern charcoal irons showed weakness in one transaction of considerable magnitude. Lake Superior charcoal has been dull, but the few transactions show the market to be strong. Large buyers of foundry irons are pretty well supplied at the present time, but the smaller ones are casting about, endeavoring to place their orders now for as long deliverles as they can get, being assured that bottom prices have been reached. The week at Chicago has been on the whole an active one. Several good sized transactions in Southern irons have been closed and at prices that are a slight improvement on figures obtained in that market a week or two ago. Whilst no large orders have been placed in St. Louis during the week, there has been and continues to be a steady buying movement. Southern furnaces having secured a heavy aggregate of orders, are no longer desirous of pressing sales; and they are asking higher figures, especially for late deliveries. Ohio softeners remain firm, with a fair demand. There is no large business doing in charcoal irons; but furnaces claim to be well sold, and refuse concessions. The firmness in tone noticed in the South during the latter part of last week has culminated in an advance at Buffalo of from 25 to 50c. per ton on all foundry grades. Northern irons are still weak, but there are no changes in prices to report from that quarter. An active buying movement exists at Louisville. The market is not regular, though the tendency is upward. Selling for delivery during the last part of the year on the basis of $11 grey forge, at furnace, is indulged in by some of the larger companies. Notwithstanding some of these companies have bought roundly they are in the market for more iron, showing that they feel the present time a desirable one to buy heavier than ordinarily. The improvement which is reported from some quarters has not yet been felt at Pittsburgh, as far as mill iron is concerned. Bessemer iron seems to have touched bottom at last.

Iron Ore. To the close observer it must be evident by this time that, at least as far as the producers' interests are concerned, the present season will bring considerable disappointment to the iron ore trade. When the heavy sales of last Fall were being negotiated, and when every producer of iron ore found a market, at his own rate, for anything he had to offer, the opinion was advanced—and at that time it seemed to be justified by the facts—that the 1890 production would reach, if not exceed, nine million tons. Since then, the situation has been materially changed, and it is apparent to the most sanguine that a modification of that estimate is in order. It may be that, in a great many instances, ore producers were governed in their sales by the desire of purchasers, rather than by a knowledge of what they could produce; that, not infrequently, they trusted to luck in getting out the ore they offered for sale; or, it may be, that they honestly over-estimated their resources. At all events, it is quite plain now, when a million or more tons of ore remain unsold, that it will require hard work to fill existing contracts, and that the dropping off in the enormous sales of last October and November was a blessing in disguise. Owing to the depressed condition generally, there is no call now for this ore, and there is none likely to be for some time to come; but the holders are satisfied to wait a turn in the tide and quotations remain firm. Somewhat of a novelty is presented by the sale this week of the first cargo of foreign ore, carrying only .001 per cent. of phosphorus, and the importers are confident that it will be a long time until any more foreign ore is received in this country. This fully bears out the statement made some time ago of the sales made in England of the Spanish ores usually imported to America, and of the consequent necessity on the part of Eastern steel makers to come into this market for their supply of Bessemer, in the ore or in the pig.

Pig Iron. So far as prices and sales are concerned, the situation remains unchanged, and pig iron continues as plentiful as it is cheap. Still, the volume of sales is on the increase and the reports for the week show a total of nearly two thousand tons for May and June delivery. While some of the larger furnaces decline to quote prices for Bessemer, some sales are reported in the Valley at about $17.00 cash, and that seems to be the ruling quotation. Foundry iron has experienced no change from $17.00 for No. 1 and $16.00 for No. 2, while mill iron is held firmly at $15.00. These prices, of course, are cash at the furnace. The main reason for expecting a better market is found in the statement of furnace-men that iron cannot be made without a loss at less than the present rate; but it is hardly probable that a decided change for the better is likely to be realized short of the next sixty days. It will require a sharp and active buying movement to infuse some degree of strength into the present demoralized market, as well as some little firmness on the part of furnace-men who, for the past month or more, have been chasing each other all over the country after car-load and hundred-ton orders, and who, incidentally, have been cutting each other's prices with a vengeance that necessarily told upon the entire market. Southern iron is reported to have advanced $1.00 a ton. This would seem to be in keeping with the general policy of our Southern friends, who generally manage to sell up their entire product for several months ahead at starvation prices, and then announce an advance just in time to keep themselves from filling any orders they might obtain at the better quotation.

Merchant Iron. Somebody seems to have a particular predilection for bearing the bar iron market. In any event, the price is too low for any respectable quotation, and $32.00 is the going rate. Sheets are also very weak, the price at the mill ranging from $2.70 for No. 24 to $2.90 for No. 27. Cut nails, to use one manufacturer's remark, have "all gone to pieces." Gas pipe is fairly firm, but bridge material and heavy plate is strong and selling well up to the rate.

THE LAKES LEAD THE VAN OF COMMERCE.

Most remarkable statistics are given in the extract from the recent argument of Hon. George H. Ely before the Committee on Commerce of the Senate of the United States, reproduced in another column. That there passed through the Detroit river, in the 234 days of navigation in 1889, the enormous total of 36,203,586 tons of freight, will astonish any one who has not paid attention to the subject; but when it appears that this aggregate represents twelve times the total carried *over* it by the railroads during 365 days of 1889, the surprise will be intensified. When, on top of this, we consider that the movement through the Detroit river in 1889 was at least ten million tons above the total registered entries and clearances at all the seaports of the United States, and three million tons above the combined foreign and coastwise registered tonnage of the ports of Liverpool and London, for the year 1888, the statement seems almost incredible. Yet the figures produced were, we are informed, obtained in all cases, from official sources and cannot be successfully impeached. Boiled down, the magnitude of the commerce of the lakes appears from these facts:

The tonnage movement through the Detroit river is larger than that of any harbor or port in the world, or through any other channel of commerce in the world.

It was, in 1889, twelve times greater than the rail tonnage movement over it.

It exceeded, by ten million tons, all the registered entries and clearances at all the sea-ports of the United States.

It was greater than the foreign and coastwise commerce of London and Liverpool combined.

It represented a total iron ore tonnage carried through this river, in 1889, of 5,250,000 tons.

It represented a value of property moved amounting to over $80,000,000.

It represented an aggregate freight bill for the season of $44,513,646.

It represented a saving over the rail charges for an equal tonnage for the year of $103,865,174.

It gave encouragement to the building, during the past four years, of 206 large steel vessels, with an aggregate capacity of 399,975 tons, and at a total cost of $27,389,000.

Mr. Ely has done an invaluable service to our lake commerce, as well as to the country at large, in the painstaking collection and collation of these most remarkable figures.

ORACULAR UTTERANCES FROM A TIN IDOL.

The New York *Tribune*, Philadelphia *Press*, Cincinnati *Commercial Gazette*, Cleveland *Leader*, Chicago *Inter-Ocean*, *Iron Age*, *American Manufacturer*, *Industrial World* and several other influential advocates of an American tinned plate industry will be interested in learning from the *American Artisan's* article (reprinted elsewhere) that their "knowledge in relation to tinplate is circumscribed to their acquaintance with the family wash-boiler." This is worthy of note. Even a superficial acquaintance with the family wash-boiler implies a slight familiarity, at least, with a "clean biled shirt." So we have on that side of the question, to start with, a certain degree of respectability, as distinguished from the great mass of unshirted and unwashed, with whom our amiable contemporary, no doubt, delights to consort.

But, seriously, this Tin Idol of the Windy City—this "Literary Hercules,"—shows altogether too much feeling on the subject. It also strains the English language to make the only point in its article visible to the naked eye. The monopoly enjoyed by the Welsh tinplate manufacturers has been too apparent to be dismissed by a definition. As a matter of fact, the Welsh makers have had "exclusive command or possession" of American markets. The time has now come, in the judgment of the American people (our Literary Hercules excepted), when this exclusive possession should be transferred to this side of the ocean, where it justly belongs. Of course, the importing interests are opposed to thus building up an independent industry in the United States. Of course, the Chicago *Artisan* voices their objection. But identically the same objection was raised when we broke away from the English steel rail monopoly; yet, who would have us return to it?

Our critic writes like an Englishman to the manner born. He appears to be vastly more solicitous for the welfare of Welsh manufacturers than the prosperity of American industries. His illustration of the Washington iron journal is unhappy. American industries do not need protection against each other, nor are they particularly solicitous as to the condition of foreign concerns. A more apt illustration would be to suppose—what is far more natural, in view of the general tone of the *Artisan's* article—that our Chicago contemporary was published in Wales and had a monopoly on all the news relating to the tinware trade; that, owing to unwise laws, no such paper could be published on this side of the Atlantic, thus compelling American readers to subscribe for the Welsh paper; that the people of the United States were to decide that they might as well have just as good a paper to represent their own interests and give employment to their own printers, pressmen and editors; and that they proposed to rectify the unwise legislation, and make themselves independent of foreign dictation. In such a contingency, we would expect a howl from the Cimbrian oracle, in comparison with which the present howl would be as a gentle whisper.

The *Artisan* does *The Iron Trade Review* the honor of ranking it as "an out-and-out Protection publication." Thanks. We are pleased to know that there can be no possible mistake as to our position on this paramount issue.

CONDITION OF THE COKE TRADE.

As might be inferred, the lull in the pig iron market has had its direct effect upon the Connellsville coke trade. According to the Connellsville *Courier*, about one-fourth of the ovens of that region are at present idle. Last week saw a large addition to the list of idle ovens, and the coke makers appear to be pursuing a very wise and conservative policy in curtailing production to correspond with the blowing out of furnace stacks. Another reason for their pursuing this policy is the fact that this is the time of the year for making furnace repairs, so that a falling off in demand for coke in naturally to be expected. In the meantime, by a strange anomaly, a great many new ovens are building this year, the excuse being that they will be needed for the future. The *Courier's* detailed report of the operation and output of the Connellellsville region for the week ended April 12 shows 13,690 active and 969 idle ovens, as against 13,878 active and 777 idle at the date of the last report. Production remains about the same, being 109,535 tons, as against 109,970 tons the previous week. Shipments have dropped a trifle, but not so greatly as might be supposed. The output for the week was 6,145 cars.

Prices remain as follows: Furnace coke, $2.15; foundry coke, $2.45; crushed coke, $2.65; all per ton of 2,000 pounds, f. o. b cars at ovens.

Freight rates per ton of 2,000 pounds from the Connellsville region, which includes any part of it, to points of consumption, are as follows:

To Pittsburgh	$0.70	To Louisville, Ky	$3.20
To Mahoning and Shenango valleys	1.35	To Chicago, Ill	2.75
To Cleveland, O	1.70	To Milwaukee, Wis	2.85
To Buffalo, N. Y	2.25	To St. Louis, Mo	3.35
To Detroit, Mich	2.35	To East St. Louis, Ill	3.20
To Cincinnati, O	2.65		

This will make prices at these points of consumption as follows:

	Furnace.	Foundry.	Crushed.
Pittsburgh	$2.85	$3.15	$3.35
Mahoning and Shenango valleys	3.50	3.80	4.00
Cleveland	3.85	4.15	4.35
Buffalo	4.40	4.70	4.90
Detroit	4.50	4.80	5.00
Cincinnati	4.80	5.10	5.30
Louisville	5.35	5.65	5.85
Chicago	4.90	5.20	5.40
Milwaukee	5.00	5.30	5.50
St. Louis	5.50	5.80	6.00
East St. Louis	5.35	5.65	5.85

On the whole, the coke situation is one of expectancy. How soon expectations will be realized remains to be developed.

TINPLATE vs. TINNED PLATE.

In our able contemporary, the London *Iron and Steel Trades Journal*, we find the following:

The Iron Trade Review, Cleveland O., announces: "The first block of tin ever made in the United States was received at the office of the American Tinned Plate Association, in Pittsburgh, the other day. Carry the news to Wales." The American papers are making great capital out of the discoveries of tin in Dakota and elsewhere. The advocates of an increased duty on tinplates pretend to believe that the great barrier preventing Americans competing against Welsh makers has been the want of tin deposits in the States. Now they assert that tin mines have been opened, and this settles the whole question. It is true that we have tin mines in Devon and Cornwall, but the value of the metal obtained does not average one million sterling yearly, and we import tin—foreign tin—to the value of three millions sterling annually, though one-half of the foreign tin arriving here is re-exported. The Protectionists wish the American people to believe that tin-plates are but block tin rolled into sheets, instead of iron sheets dipped in tin. The small percentage of tin which goes to make a tin-plate may be estimated from the fact that to day tin is worth £90 a ton, and tin-plates are selling at £14 a ton. The discoveries of tin in Dakota, and the block of tin being exhibited at the offices of the American Tinned Plate Association are, we fancy, "bunkum."

We shall see ere long what the Black Hills discoveries amount to. In the meantime, we would have the *Iron and Steel Trades Journal* believe that the Protectionists are not such ignoramuses as to

believe, or such knaves as to cause others to believe, that "tin-plates are but block tin rolled into sheets, instead of iron sheets dipped in tin." No departmental decision has been the subject of more widespread discussion and criticism than that of Secretary Fessenden, in which this heresy was first promulgated, in the interest of New York importers. No stronger effort has been made in the discussion of the question by the Protectionists than to disabuse the public mind of the notion that tin-plates were, in reality, not tin-plates, but tinned plates. In evidence of this we point to the fact that the most active organization for the establishment of a tin-plate industry in the United States is the American *Tinned* Plate Association. The *Journal* is wrong again.

"DON'T TRIFLE WITH EDGE TOOLS."

The hardware trade seems to have fairly locked horns with the axe and tool trust. Coincident with the organization of the American Axe and Tool Company came an advance of prices amounting to 40 per cent. over rates previously prevailing, with the intimation that a further advance of 10 per cent would probably soon follow. The result of this movement is thus set forth by the *Iron Age*:

This condition of things is having its natural effect in suggesting to houses the feasibility of obtaining goods from outside sources. There are accordingly rumors current of the resuscitation of old works, the establishment of new plants and of the entrance into the market of a large steel forging concern with a line of axes. The names of prominent jobbing houses are connected more or less indirectly with some of these prospective enterprises, and, as indicating the feeling, it is to be noted that the W. Bingham Company, Cleveland, O., have already issued a circular announcing that they have made arrangements for non-monopoly axes, which will be sold with a full warranty, and, in connection with this announcement, the suggestion is made that their customers await definite advices before placing their orders elsewhere. The policy of the American Axe and Tool Company in closing some of the works tends also to encourage the establishment of new factories, as not only are skilled axe makers thus put adrift, but competent superintendents and other master workmen who are solicitous of being concerned in the establishment of a new axe plant.

To what extent this movement will go is, of course, hard to predict, but it may be said that the general feeling in the hardware trade is indicative of a determination to make a fight on the main issue of lower prices. Two factors remain to be noticed, however, that may deter a general movement in the direction of establishing "anti-monopoly" plants, viz.; the natural disinclination of capital to go into a fight against a compact and strongly entrenched organization, and the general belief that the present prices cannot be long maintained. The whole situation is one of widespread interest to the trade.

"TRADE FOLLOWS THE FLAG."

We note the following item in a foreign exchange: "Sir John "Lubbock, the great London banker, at the annual meeting, this "month, of the London Chamber of Commerce, drew attention to the "fact that more than half the ships on the ocean were carrying the "British flag. Looking at the shipping which passed through the "Suez Canal, as a test, it was found that in 1889, of 6,800,000 tons, "5,400,000 were British, while out of 3,400 vessels 2,000 were British. "Pleasant reminders, such as these, of the old truth that *trade follows "the flag*, come at the right time, at the opening of the second quarter "of the year."

On referring to Oldham's Statistical Chart of Tonnage and Commerce, we see that the value of British imports and exports in 1889 amounted to no less a sum than $3,376,514,000, whilst our total for the same period was only $1,487,533,027. If further proof were needed of the necessity—the immediate necessity—for assisting and protecting our foreign shipping we may point out that last year the freight tonnage that passed through the St. Mary's Falls Canal aggregated 6,932,203 tons.

THE very interesting statistics of Southern banking interests, recently published by the *Manufacturers' Record*, Baltimore, have been put in pamphlet form by Mr. R. H. Edmonds, editor, and various valuable statistics added. Mr. Edmonds is doing invaluable service to the South.

THE new tariff bill has so many good features that the one or two inconsistencies stand out in bold relief. For instance, the removal of the duty on nickel ores. It looks as if there were a job in this. Can any Ohio investors in Canadian mineral lands answer?

LATER reports regarding the embarrassment of the Moss Bay Hematite Iron and Steel Company, Limited, of England, are to the effect that it has gone into liquidation. Its American enterprises (in Washington) are reported progressing favorably, however.

SOME OBSERVATIONS ON THE TINNED PLATE QUESTION.

Under the head of "Monopolies, Real and Unreal," the *American Artisan* (Chicago) of April 19, gives vent to his feelings as follows:

The proposed tariff tax of 2.2 cents per pound on imported tin-plates has given an opportunity for a vast amount of misinformation in regard to the manufacture of this useful metal and the economic questions involved in the closing of our gates against the foreign product. Individuals whose knowledge in relation to tin-plate is circumscribed to their acquaintance with the family wash-boiler, do not hesitate to pose as public teachers and assume to enlighten their denser fellows. Taking their cue from the Pennsylvania and Chicago adventurers who have a "sinch" upon promising mining property in the Dakotas, the section of the press which supports the "grab" policy of the monopolists has not hesitated to distort facts in order to mislead the public, and thus make the operation of robbing them one less easily detected. It would require the services of a literary Hercules to combat these misstatements in detail. It may, however, serve a good purpose to point out a few of them. *The Iron Trade Review*, an out-and-out protection publication, in its issue of March 20th, labors to show that the Welsh tin-plate industry is one of the greatest monopolies of the day, quoting, in support of its assertion, the fact that the production of tin-plate is in the hands of only forty-five "actual owners" of tin-plate mills. Says our contemporary:

"Brought face to face with the fact that the customer, who has been taking nine-tenths of their annual product, proposes to go in the same line of manufacture himself, and even now suffering from the effects of over-production, so that a radical restriction in output is seriously considered, our transatlantic friends look out upon the probable course of trade in 1890 and 1891 with anything but pleasant anticipations."

This, of course, is true. What would be the position and state of mind of our contemporary in case a body of individuals started an opposition iron journal in, say, Washington, D. C., where funds are abundant—first taking the precaution to lock up the present patrons of our esteemed and amiable contemporary in their homes, so that they could neither bask in the light of its counsel nor make their yearly remittances? Would its management not have something of a fellow-feeling for others in similar straits? If the present tariff bill becomes a law, this will be the position of the Welsh tin-plate manufacturer. He cannot make his product to-day and sell it at a living profit at ruling prices. Values of raw materials have risen, wages have increased and, although his mills are situated amid the rich Welsh hills, with their treasures of coal, the native manufacturer finds himself ground beneath the nether millstone. To add to the difficulties of the situation, new mills have been built and started, without regard to the conditions of demand and supply. The inevitable consequences have followed this blind adherence to the practice of his fathers, which is the Welshman's industrial rule of faith. To say, however, that the trade is a monopoly is simply to misstate the situation. We make the announcement with due estimate of its force. But, lest we may be accused of quoting partially for our own purposes, let us give our contemporary's words "according to the indictment." Here they are:

"It will be a matter of some surprise, on this side of the water, to learn that, although there are 500 mills engaged in the production of this annual output of six hundred thousand tons of tinned plates, these mills being owned, nominally by eighty or ninety different firms, the actual owners may be reduced to about forty-five, showing a monopoly which, located in this country, would have furnished the free trade theorists a never-ending theme of reiteration against the evils of a protective system."

According to Webster, for whose scholarship we have the most profound respect, the word "monopoly" means "the sole power of dealing in any species of goods, or of dealing with a country or market, obtained either by engrossing the articles in market by purchase or by *a license from government*; sole permission and power to deal; exclusive command or possession." Now under none of these various heads can the Welsh tin-plate maker be justly condemned. He is in the business for the reason that his father was before him, and because he knows how to make tin-plate better than any other man in the world. In addition to this the business has been a profitable one, hence outsiders have ventured into it, thus increasing the supply to an unprofitable extent. Welsh industry is not subsidized by the English government either in this or any other manufacturing line. Anybody—even our contemporary were he so disposed—could set up his plant and put his wares upon the market if his experience and capital were sufficient to make the venture appear a paying one. The English government does not make a practice of doling out charity in the shape of bonuses and extra taxation to help establish and sustain classes and cliques, whose purpose is to enact the tithe-gatherer under the guise of a "developer" of their country's resources. Hence the Welsh tin-plate industry is in no sense a monopoly, the manufacturers of no other country being shut out out by an insurmountable wall.

As we have said, the proposed McKinley bill will either partially or wholly shut out the Welshman from our markets—or perhaps we should say, the enhanced duty will offer an excuse for a still further twist of the screw which will, unless the people awake from their slumber, ultimately result in this. Then we shall have a monopoly indeed—one which agrees with all the conditions "laid down in the bond"; a fit associate for its predecessors of similar ilk, the government-fed monstrosities which have absorbed the labor and earnings of the people, and whose defenders now pose as conservators of the public weal and sole pilots of the Nation's destiny.

AN article of timely interest in May *Lippincott's* is "Subsieies and Shipping," by Henry W. Raymond. This is a powerful plea for subsidies for our merchant marine. Mr. Raymond points out that all nations who are leaders of commerce grant subsidies to their shipping, and argues that in order to compete successfully with foreign nations, we must adopt their methods.

IRON AND STEEL MANUFACTURE IN FRANCE.

A most interesting paper was presented by Professor S. Jordan, of Paris, at the recent meeting of the British Iron and Steel Institute in that city, in which he shows the progress made in the manufacture of iron and steel between the years 1877 and 1887, the latter being the last returned in the official statistics.

From a commercial point of view, the statistics of France are not of great interest to us, since we neither import nor export iron and steel in any great quantity to or from that country, nor do we meet French competition seriously in other markets; but we cannot afford to neglect the progress France is making in the technical details of the manufacture. The French seem to devote more attention than either our British friends or ourselves to scientific research in connection with manufacture, and, as the president of the Iron and Steel Institute said in his address at Paris, the French chemists have rendered great service, not only to their own native industry, but to the world at large. From this point of view, we propose to note a few extracts from Professor Jordan's paper which show differences between French and American practice.

Coke.—Coke is now produced in France almost only in the improved coke ovens, called Belgian, of the Imet, Coppie or other analogous systems, in which the coal is introduced through hoppers placed in the arched ceiling of long rectangular and horizontal chambers or vaults, open at both ends, and the extraction of the coke is effected by means of mechanical pushing rams. The vertical Appolt ovens are not now much in use. The obsolete beehive ovens are used only at one or two collieries, but their products are not used for blast furnaces, and are only used for foundry purposes.

As the beehive oven is in almost universal use in this country, the knowledge that it is obsolete in France is something of a surprise. Is the Frenchman more progressive than the Yankee, or is there such a difference in the coal of the two countries that the beehive oven is best for one, and the Belgian for the other?

The small coals carbonized are seldom of only one origin. The coke makers rather try to make economical mixtures by associating the dearer coking coals with the largest possible proportion of the cheaper non-coking coals, so as to come as near as possible to the limit of the property of coking. These mixtures are made with great care by means of various apparatus. The coke makers have in that way been able to notably lessen the cost of production of coke, owing to the use of the Coppie and other ovens which produce good coke with coals that would not cake in the beehive ovens.

This is in strong contrast to the American system. We do not think our own coke makers have made any serious attempt to reduce the cost of coke making, unless the importation of cheap Hungarian labor can be called such an attempt.

The application of coke ovens to the production of tar and ammoniacal salts, has found a place in some collieries, but commercial circumstances have not favored the extension of the manufacture of by-products. The quality of the French coal does not suit this special industry of by-products so well as the English or German coals.

Pig Iron.—The production of coke pig iron increased in ten years from 1,372,000 to 1,547,000 tons of 1,000 kilos, while the number of furnaces decreased from 133 to 84. The charcoal pig iron production decreased from 80,000 to 12,000 tons of 1,000 kilos, and the number of blast furnaces from 84 to 12, the industry being now quite unimportant. This is a contrast to the condition in the United States, where the production of charcoal pig is still increasing, although slowly in comparison with coke iron.

The Rollet Process.—Some of the iron works in the Loire region are using for the production of superior iron and steel with ordinary pig, a special refining process (Rollet's process). It consists in melting the pig with an extra-basic slag, obtained by means of fluor spar and limestone. The melting is effected in a basic-lined or water-jacketed cupola furnace blown by hot blast. The pig iron is thus purified by the removal of the greater part of its sulphur, and of a certain part of its phosphorus. The fired metal is sometimes cheaper than the pure pig made with manganiferous foreign ores.

Silico-Spiegel, etc.—The St. Louis Marseilles Iron Works exhibited at the Paris exhibition an interesting set of products, superior spiegeleisen and ferro-manganese (up to 87 per cent. manganese), silico-spiegel (up to 14 per cent. silicon), ferro-silicon (up to 14 per cent. silicon) and ferro-chromium (up to 65 per cent. chromium). The Tamaris and the Beaucaire furnaces also exhibited ferro-chromium.

Puddled Iron and Steel.—In the United States, in spite of the enormous increase in the production of steel and the prediction for many years past that it would drive puddled iron out of existence, the production of wrought iron still continues, and there was more of it made in the year 1888 than in any preceding year. In France, however, iron is getting worsted in the struggle, and its production is decreasing. The following figures tell the story:

	1877.	1887.
Number of puddling furnaces (iron)	995	637
Number of puddling furnaces (steel)	51	35
Number of open fires (iron)	243	53
Number of open fires (steel)	6	5
	Tons.	Tons.
Production of puddled iron	821,006	617 997
Production of charcoal refined iron	63,487	16,864
Production of puddled and refined steel	20,273	12,512

The use of double-puddling furnaces is becoming more extended, some being adapted to receive as much as 500 kilogrammes (1,102 pounds). Mechanical puddling is not much used. There are, however, some furnaces provided with mechanical or automatic stirrers, or rabbles, as well as some furnaces with round revolving hearths, such as the Pernot system, and also some rotating furnaces of the Bouvard system for the making of superior puddled iron to be melted in the open hearth.

Bessemer Steel.—The figures for 1887 show twenty-eight converters active, with a total output of 324,900 tons. Of this it is estimated that 143,000 tons were basic steel. The new steel works established during the last ten years have been located in the close neighborhood of seaports, so as to receive Spanish and Algerian ores by sea, and avoid railway freights. The same tendency to locate near the seacoast is observed in England.

The Longevy steel works make from 250 to 300 tons of basic steel per day with their own pig, the analysis of which is as follows:

	White iron. Per cent.	Mottled iron. Per cent.
Manganese	1 50	2 00
Carbon	3.00	3.20
Silicon	0.20	0.35
Sulphur	0.04	0.02
Phosphorus	2.00	2.20

They produce especially extra soft steels for making wire, nails, etc., the breaking strain of which is less than 50,000 pounds per square inch, with an elongation of more than 27 per cent. Its composition is as follows:

	Per cent.
Carbon	0.08
Manganese	0.25 to 0.30
Phosphorus	0.03 to 0.05

Open-Hearth Steel.—There were 69 open-hearth furnaces at work in 1887, which produced 143,764 tons. The size of the furnace has steadily increased since its first introduction. Instead of the three to four-ton furnaces first used, ten-ton, twenty-ton and even, as in some steel works of the Loire district, thirty-five-ton furnaces can now be found. The majority are of the fixed type, the so-called Siemens-Martin furnace. In two or three works only can the Pernot furnaces be found, with a revolving circular basin or hollow hearth, or the Batho furnace, with round hearth, supported by an iron plate fill underneath, and round regenerators with plate iron casing, placed laterally and above ground. All these furnaces are treated by generator gas. Water gas and petroleum have not yet been tried for the purpose. The number of casts in twenty-four hours varies, according to the different works and types of furnaces, between two and four.

The nature of the lining varies in the different works. Sometimes it is acid, that is, made with sand, gauester or silicious puddle; sometimes it is basic, that is made with magnesia brick or puddle, or with dolomitic bricks and blocks; at other times the lining is neutral, that is, made with chrome ore, according to the Valton-Remaury process. When the lining is made with chrome ore, Messrs. Valton and Remaury state that material is taken from the lining, either by the molten metal or by the slag, so that no corrosion takes place, and it becomes possible to act on the metal either by scraps, or by ores, or by various agents, in such a manner as to effect a complete dephosphorization, and to produce various descriptions of steel.

The dephosphorizing mode of working, properly so called, that is, the conversion of truly phosphoric pigs into cast steel by the open-hearth process, is not yet much used in France. This description of pig iron is sooner dephosphorized in the Bessemer converter. On the other hand, the basic or neutral lining is used for making open-hearth steel with ordinary pig and scrap—not free enough from phosphorus to yield good steel on an acid lining, and too low in phosphorus to be worked in the basic converter. Some of them are even working pure pig and scrap upon basic and neutral hearths, and produce soft and extra soft steels of very high quality, these steels being, besides, either simply carbon steels or steels into whose composition enter silicon, manganese and chrome.

At the exhibition, there were shown a 100-ton ingot by the St. Chamond works, and an 86-ton ingot by the works of the Marrel Brothers.

The output has increased but slightly during the ten years. Crucibles are not only employed for producing tool cast steel by the fusion of blister steel, or for making homogeneous iron by the fusion of pig iron with malleable iron. It has now taken a prominent place in the manufacture of the new steels, in which several substances beside carbon are alloyed with iron.

The Mineral Resources of Persia.

Perhaps the very best authority on the subject is General A. Houtum Schindler, who served the Shah for a great many years, and who is now acting as Inspector General of Mines for the Imperial Bank. He has repeatedly traveled through the mining districts of Persia, and many of his reports on the subject have been published by the Vienna Geological Institute. The four most valuable minerals in the country are coal, iron, copper and lead, while it has been ascertained that there are large deposits of the purest petroleum in Southwest Persia. In the north of Persia a coal field of great extent has been proved to exist in the neighborhood of Teheran. The coal has been tested, and experts affirm that it will bear comparison not unfavorably with the best English coal. Another coal field of excellent quality has more recently been discovered in the Gisakim Hills, less than fifty miles from Bushire. English coal at that port sells at an average price of 43s. 4d. per ton, and it is computed that Persian coal could be sold there, leaving a large profit to the exploiters, for little more than half that price. The total area covered by the coal fields of Persia is believed to be very vast, but the value of even those that have been named is really immense, and must contribute greatly towards the national development of the country. Nor are the iron mines less promising than coal. Those in the vicinity of Teheran are very rich, the ore containing about 70 per cent. of metal, and they are situate within half a mile of the coal field. Iron does not seem confined to the one spot, as General Schindler stated some time ago that iron and coal occur in juxtaposition throughout the hills skirting the road from the capital to Kazvin, or even further west. Much of the Persian iron is noted as containing hardly any sulphur and no phosphorus.

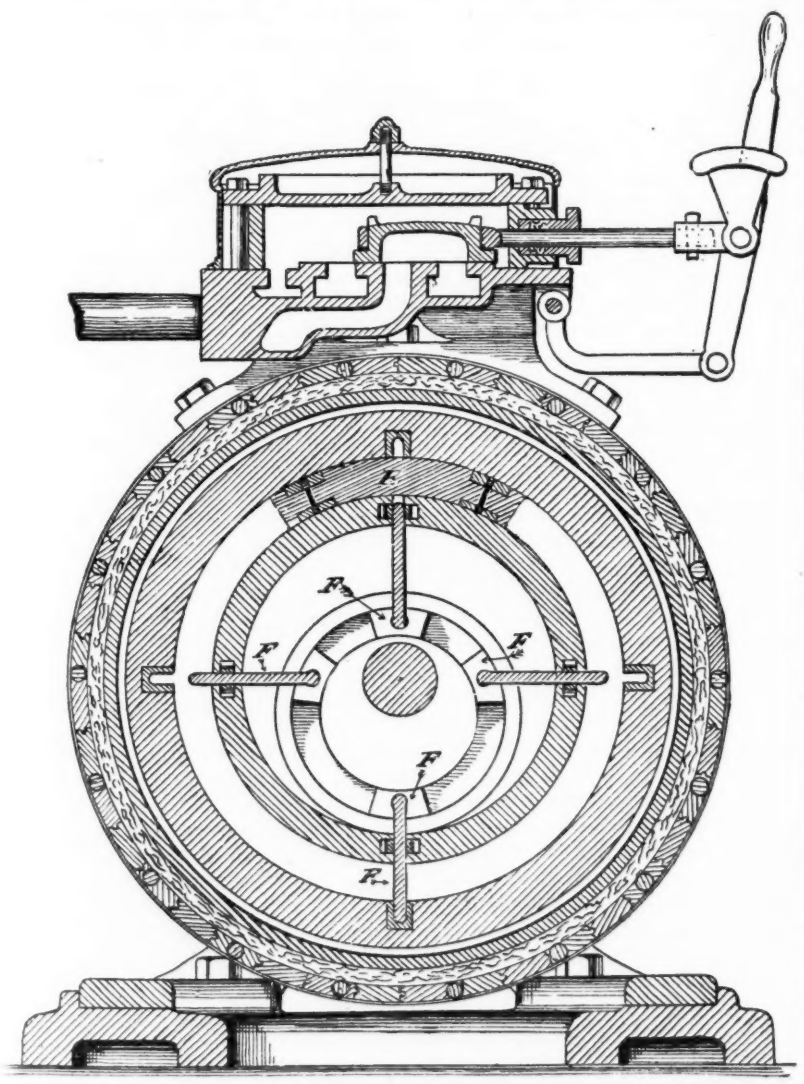
THE May *Wide Awake* opens with a portrait of the author of "The Heir of Redclyffe" and "The Daisy Chain," Miss Charlotte M. Yonge. The illustrated papers are very interesting; "The Aprons of Paris," by Josephine Jenkins, is illustrated by Henry Bacon, and "The Upper Ten," by Eleanor Lewis, has a dozen "taking" pictures from prints and photographs.

DUPLEX ROTARY ENGINE.

The accompanying cut represents an interior view of the Duplex Rotary Engine, invented and patented by Messrs. Meyer, Kiehl and Grant. The inside wheel represents the cylinder, and the letter E, the stationary abutment; which is the same as the head of the piston engine. The letter F represents the pistons or cut-off, these are operated by a stationary cam. This stationary cam moves the pistons out and in under the stationary abutment. The steam chest on top of engine contains the slide valve, same as shown on cut, which is operated by a lever to start, reverse or stop engine, and also answers the purposes of an exhaust under slide valve, as in an ordinary piston engine. The steam enters the engine on both sides alike, which equalizes the pressure. The inventors claim for the same, an economy of steam, which the measurement show they get.

In this engine as is demonstrated in cut, the steam entering through the port is confined in the steam chamber. This chamber being toward the outer end of the inside wheel, gives the steam a leverage which is an increase of power; the steam is carried entirely around in this chamber and cut off by the four pistons, giving it a clear and distinct cut off, as in straight line piston engines. The engine is really the piston engine put in a rotary movement. In view of the fact that the electric power has come more in constant use, the demand for high speed engines has been materially increased.

The best mechanical experts and engineers have conceded the fact that the rotary engine, on account of its continuous motion and steady pressure, would be by far the best engine for all high speed purposes. A vast number



of rotary engines have been from time to time invented, which have proven unsatisfactory, because of the excessive consumption of steam and their liability to wear out soon. The obstacles are all overcome in the Duplex Rotary Engine, the parts within being so compact that nothing can become displaced or disarranged. The construction of this engine is on entirely new principles, the inventors having discarded every feature that might lead into the beaten paths of others who have gone before. There is no point in its design that cannot be fully indorsed, nor are there any engines of the class in which the strain and friction are so well resisted. The endurance of the working parts are so well secured and the power obtained in so direct and simple manner. These engines will be built of various capacities, ranging from 1 horse-power to 1,000 and over, as may be desired. They can be adapted for all work where power is required for marine, railroad or stationary purposes. The motive power can be utilized by steam, water or compressed air.

The leading engineers of Chicago, and those from a distance, who have studied and carefully examined the working parts of the engine and the method of its application of power, pronounce it the best and most practical rotary engine ever invented and put into successful operation. One of the engines is doing successful work at the exposition building running arc electric dynamo. Manufactured by the Duplex Rotary Engine Co., room 5, Grand Pacific Hotel, Chicago, Ill.

Lippincott's Magazine is showing remarkable enterprise in securing all the greatest novelists at home and abroad to contribute to its pages. The May number contains a novelette by Bret Harte, entitled "A Sappho of Green Springs." That Mr. Harte's residence abroad has not dulled his genius for depicting Western scenes and character is abundantly proven by his latest story, which is one of the brightest and cleverest products of his brilliant pen.

IRON MINING IN CANADA.

We have received from Mr. T. D. Ledyard, of Toronto, a letter enclosing a communication which he recently sent to the Toronto *Globe*, in answer to the *Canadian Manufacturer*, regarding the wages of Canadian iron miners. In commenting upon this communication, Mr. Ledyard says that it will "serve as an answer to the assertion of the *Engineering and Mining Journal* in stating that the wages of iron miners in Canada were higher than those of American miners, while, as a matter of fact, they are much less." We fail, however, to see that Mr. Ledyard makes his point in the communication in question. While it is doubtless true that mining has been done in Canada at the low cost of $1 per ton, even Mr. Ledyard will have to admit that, with the conditions of Lake Superior mines paralleled in Canada, the above rate could not be maintained a single day. It is very easy to figure low costs when a mine is first opened up; the real business of mining commences, however, after the operations have been carried on to an extent that calls for expensive plants of air compressors, pumping machinery, hoisting appliances, etc., and where the work is mainly far underground. We cannot believe that Mr. Ledyard is not informed as to these points of difference, yet we do not recall a single instance, in any of his newspaper letters, where he has taken up and candidly considered this essential feature of the case. If the argument for reciprocity rests upon no stronger argumentative foundation than this, it does not appear to be worthy of serious consideration.—[Cleveland Iron Trade Review.

We request the attention of Canadian workmen, particularly those who may think of engaging in iron mining, to the above. Mr. Ledyard desires to make the impression upon the minds of American users of iron ore that if reciprocity prevailed between Canada and the United States, so that he could send the ores from his Peterboro' mine into the United States free of duty, he could sell them to American furnaces at very much lower prices than he can do now. He boasts to *The Iron Trade Review* that, as a matter of fact, the wages of Canadian iron miners are now much less than the wages of American miners, and that under reciprocity they would be still further lowered. The Toronto *Globe* agrees with Mr. Ledyard in this; and the exceedingly small pay they promise Canadian miners is what they call "good wages." Mr. Ledyard's racket won't work.

Against Cast Steel Guns.

A Washington dispatch says: At last the authorities of the Navy Department seem about to arrive at some conclusion in regard to the open hearth steel cast gun made at the Thurlow Works, in Chester county, Pa., and whose test at Annapolis followed the disastrous trial of the Hainesworth (of Pittsburgh Bessemer steel cast gun. It will be remembered that the Thurlow gun stood the statutory test of 10 rounds without bursting, but that it showed an expansion, a very small fraction greater than the expansion of a "built-up" gun after a similiar test.

The question then arose whether the gun was a serviceable one within the meaning of the law, and the decision of this question hung fire during the latter part of the Whitney administration of naval affairs, and up to this time under the Tracy administration. A day or two ago the officials at the Annapolis Proving Ground were instructed by telegraph to give the gun a further test of ten rounds. This was done, and the cast gun again refused to burst but it showed an expansion nearly double the former expansion, and several new and serious flaws developed.

The Chief of the Bureau of Ordnance thereupon decided to report unfavorably to acceptance of the gun, and this report was sent to the Secretary of the Navy. If the Secretary approves the report it will then be urged by the Thurlow people that a decision must, under the law, have been made after the statutory test of ten rounds, and not after 20 rounds, and that if the Department could not truthfully say after the statutory test that the gun was not serviceable, then the makers should have the $5,000 and upward provided by act of Congress.

The interesting question to naval authorities is how much more will the gun stand? And there is a general desire to have it proven to the point of bursting. The endurance of the casting has been a surprise in naval circles, and, though this gun failed, confidence in the possibility of making a successful cast gun has been vastly strengthened.

The Thurlow people themselves say that this gun was tempered too soft, and that they have no doubt that cast guns could be made a success with a little experimenting, properly encouraged by Congress. They think, however, that they should have been paid for the gun under discussion, but there is little doubt now that Secretary Tracy will approve the report of the Chief of Ordnance.

For Building Steel Ships at New Bedford.

A company has been formed with a large capital to establish a plant in New Bedford, Mass., for building iron and steel sailing and steam-ships. The proposed vessels are to be of large carrying capacity, fitted with all the modern improvements. They will be specially adapted to carry American products to all parts of the world at a low rate of freight. This company is ready to begin operations as soon as the Farquhar Subsidy bill for American ships becomes a law.

AN alloy that expands in cooling, and is suitable for repairing cracks in cast iron, is made with nine parts of lead, two of antimony and one of bismuth.

THE MAGNITUDE OF OUR LAKE COMMERCE.

In his able argument before the Committee on Commerce of the United States Senate, February 4 and 5, 1890, (just published in pamphlet form) in opposition to the bridging of the Detroit River, Hon. George H. Ely made the following almost startling comparisons:

The number and tonnage of sailing and steam vessels on the northern lakes, June 30, 1889, as reported by the Commisioner of Navigation, was as follows:

Sail,	1,285 vessels.	Registered tonnage,	325,082 tons.
Steam,	1,455 "	" "	575,307 "
	2,740		900,389

This is an increase in registered tonnage on the northern lakes, in ten years, of 310,287 tons, although a decrease in the number of the vessels on the register of 303; the size and carrying capacity having enormously increased.

What, now, was the work of this great fleet in 1889, including thirty Canadian steamers and twenty-one Canadian sail vessels, with carrying capacity of 33,500 tons, engaged exclusively in trade through the Detroit river? The carrying capacity of sailing vessels is known to be not less than 90 per cent., above the register; of steam vessels, 50 per cent., above.

At Sault Ste. Marie lock only, on the entire lakes, is there an official record kept of the tonnage moving past any given locality. Estimates must be relied upon for the Detroit river movement. Fortunately, from well-known data, a close approximation to accuracy can be reached.

	Register. Tons.	Carrying Capacity. Tons.	
Sail, 1,285 vessels	325,082		
Adding 90 per cent	292,574	617,656	
Deduct $\frac{1}{20}$ of this carrying capacity as not engaged in traffic through Detroit river, and for short trips in lumber		30,882	586,774
Steam, 1,455 vessels	575,307		
Adding 50 per cent	287,653	862,960	
Deduct $\frac{1}{20}$ as not engaged in traffic through Detroit river, and for short trips in lumber		43,148	819,812
American sail and steam, loaded once in tons			1,406,586
Canadian steam.			
Thirty steamers, capacity		20,300	
Deducting $\frac{1}{20}$ as above		1,015	19,285
Canadian sail.			
Twenty-one vessels, capacity		13,200	
Deducting $\frac{1}{20}$ as above		660	12,540
Canadian sail and steam, loaded once in tons,			31,825

American sail vessels will average 12 round trips per season. Deducting 2 round trips (4 cargoes) for occasionally going "light," or with parts of cargoes, the season's tonnage would be 20 cargoes, 586,774 × 20 = ... 11,735,480 tons.

American steam vessels will average in a season not less than 15 round trips. Deducting 2 round trips (4 cargoes) for occasionally going "light," or with parts of cargoes, the season's tonnage would be 26 cargoes, 819,812 × 26 = ... 21,315,112 tons.

Canadian sail, 21 vessels, engaged in trade through Detroit river, with 12,540 tons capacity, the season's business would be 18 cargoes, = ... 225,720 tons.

Canadian steam, 30 vessels engaged in trade through Detroit river, with 19,285 tons capacity, the season's business would be 20 cargoes, = ... 385,700 tons.

Add, now, for the lumber shipmehts, not included in above, the following:

The shipments of lumber were, in 1889:

Saginaw	432,000,000 feet.
Oscoda and Au Sable	210,000,000
Alpena	150,000,000
Tawas, Black River and Cheboygan	250,000,000
	1,042,000,000
Deduct 4 per cent. as not passing Detroit	52,100,000
	9 9,900,000
The shipments of lumber in 1889 through the lock at the Sault were	315,554,000 feet.
70 per cent. of this passed Detroit river =	220,887,000
	1,210,787,000 feet = 2,421,574 tons.
For forest products, logs, telegraph poles, etc., other than lumber, add	120,000
	36,203,586 tons.

Comment upon this comparison of railroad and water-way tonnage is not needed. The facts are the demonstration.

The lake tonnage movement, then, fairly estimated, through the Detroit river in the 234 days of navigation in 1889, was twelve times greater than that of the railroads centering at Detroit over it during the 365 days of 1889—36,203,606 tons against 3,430 242 tons! But these calculations of tonnage have corroboration from other and independent sources.

Iron ore is one of the great products moved on the water-way. That production has more than doubled during the last six years.

It was, in round numbers, in	1884	2,900,000	gross tons.
" " "	1885	3,500,000	" "
" " "	1886	4 300,000	" "
" " "	1887	4 700,000	" "
" " "	1888	5,040,000	" "
" " "	1889	7,000,000	" "

Of last year's ore production, over 5,250,000 tons passed through the Detroit river. The production of 1890 will be 9,000,000 tons. One-half of the total pig iron production of the country comes from Lake Superior ore. The traffic through the Sault Ste. Marie canal, the great bulk of which passes through the Detroit river, has been since 1881, as follows:

The fiscal year	1882	2,029 000 tons.
" " "	1883	2,267,000 "
" " "	1884	2,874 000 "
" " "	1885	3,256 000 "
" " "	1886	4 527,000 "
" " "	1887	5,494 000 "
" " "	1888	6,932.000 "
" calendar "	1889	7,516,000 "

The value of the property moved through the canal (official statement) since 1884 has been:

1885	$53,413,472.13
1886	69,080,071 95
1887	79,031,757.78
1888	82,156,019 97
1889	83,732,527.15

The number of vessels locked through in the 234 days of 1889 was 9,579.

Of the 48,640,272 registered tons passing the Sault from the opening, thirty-four years ago, 29,797,871 registered tons have passed during the *last eight* years.

These figures—amazing as they are—speak for only a single branch of this water system. The ratio of increase is no less elsewhere.

The grand aggregate of the traffic of this continental water-way is to be measured only by the growth of the country and by the equipment put afloat here to meet its demands. Fortunately, the ship-yards of the lakes are alive with preparations for it.

The last issue of the Inland Lloyds' Register (American craft only) excluding a large number of small sail craft and low grade lumber carriers, gives the insurable value of 1,974 of the 2,740 vessels on the U. S. Register, at $50,-200,800.

What has been done in the ship-yards of the lakes during the last four years will be seen below:

Winter of	Number Boats.	Capacity. Gross tons.	Value.
1886–87	31	65,750	$4,074,000
1887–88	60	108,525	8,325,000
1888–89	59	100,950	7,124,000
1889–90	56	124,750	7,866,000
	206	399,975	$27,398,000

Turn now for a moment to the difference in the cost of rail and water transportation.

The freight charges per ton per mile on 18 trunk railroads of the United States in 1887, officially reported, were .974. At the "hearing" at Detroit, April, 1889, a representative of the Michigan Central Railroad stated that the average rate of that company on through East and West-bound freight per ton per mile, for 1888, was five mills. This extremely low rate, however, due partly also to the competition of the water-way, effectually disposes of the persistent claim of that company that its business suffers for lack of better facilities for transit at the Detroit river. These alleged disabilities certainly do not appear in these traffic rates for 1888—about one-half the average rates of the 18 trunk lines reported for the same year.

But compare now this cost of transportation with the cost of movement by the water-way. General Poe reports that 6,411,423 tons passed the lock at the Sault in 1888.

This tonnage was carried an average distance of 806 9 miles. The aggregate freight charges on it were $7,883,077.40—the cost being one and one-half mills per ton per mile.

If this amount of tonnage had been moved by rail, at the rate reported by the Michigan Central Co. for the same year, viz.: five mills per ton per mile, the freight charges on it would have been $26,276,923—a saving to the country—distributed in some proportions between the producers and consumers of these products—of $18,393,846!

Some of these products could never have reached their distant markets on wheels. No possible rail rates could have moved them. They are dependent absolutely on the water-way. As to others, the water-way competition has been, and always must be, a powerful factor in reducing and regulating rail rates. This saving, however, of $18,393,846 accrued on the Lake Superior tonnage alone.

On the tonnage through the Detroit river, of 1889, as estimated —36,203,606 tons—the freight by rail at five mills per ton per mile would have been.	44,513,646 $148,378,820
On the same tonnage the freight by the water-way rates—one and one-half mills per ton per mile—would have been	
A saving in a single year to the producers and consumers of	$103,865,174

And yet we talk about bridge piers in such a channel, and at the very spot

where the entire traffic of this continental water system concentrates; where the tonnage movement during the season of navigation—seven months and a half of the year—is larger, by several million tons, than the total tonnage entries and clearances at all the seaports of the United States; where the tonnage movement is larger than that of any harbor or port in the world, or through any other channel of commerce in all the world!

Two generations of our people have contributed the unstinted millions that have been poured out to protect, to deepen and to enlarge this highway of our internal commerce; to make it what it now is—a mighty instrument for cheap transportation. These bridge propositions, purely in the interest of individuals and corporations, bring the first thought of obstruction and restriction. The story of the water-way is a part of the record of the progress of the nation. Its splendid vindication shines through all the statistics of population and production along its latitude lines between the two oceans. Yet, it has but now crossed the threshold of its great mission.

The total tonnage entries (registered) in the foreign trade at the port of New York for the year ending June 30, 1889, were	5,596,821	tons.
The total clearances in the foreign trade at the same port for the same year	5,454,415	
Total	11,051,236	tons.
The total tonnage entries at all seaports in the United States for the year ending June 30, 1889, were	13,311,652	tons.
Total tonnage clearances at all sea-ports in the United States were, for the year ending June 30, 1889	13,671,661	
Total	26,983,313	tons.
The total entries at the port of Liverpool for the year ending December, 1888, in the foreign trade	5,278,529	tons.
Total clearances in the foreign trade	4,799,968	
	10,078,497	
Coastwise, for same period	4,096,703	
Total	14,175,200	tons.
The total entries at the port of London in the foreign trade for the year ending December, 1888	7,291,825	tons.
Total clearances	4,618,993	
	11,910,818	
Coastwise, for same period	7,334,599	
Total	19,245,417	tons.

The movement, then, through the Detroit river in 1889, was at least ten million tons above the total registered entries and clearances at all the seaports in the United States. It was three million tons above the combined foreign and coastwise registered tonnage of the ports of Liverpool and London for the year 1888.

SOUTHERN STEEL-MAKING.

It is somewhat wonderful that with the vast quantity of iron ores in the Southern States that any ores suitable for the manufacture of pig iron which can be converted into Bessemer steel are very rare. We have a great mountain area of primitive rocks, which is usually most specially the repository of such ores, but as yet there are only a few points where they are known to exist. At the same time it must be admitted that that area is comparatively unknown, and until very recently was not pierced by any railroad, and that there are still large portions of it with no means of access to or from it, except by the most common country roads.

In some of these sections it is known that these ores exist, but the probable cost of reaching them has overbalanced the desire to do so, or the demand for them. Further, the vast quantity of other grades of ores which were accessible, and the possibility of making pig iron at a less cost from them, created a tendency to utilize what was in sight, rather than search for the unknown. The enormous quantity, the many facilities of transportation and the great richness of the Bessemer ores of the Lake Superior region, balanced against the fact that such ores of this grade as we have access to, and have used, are not at all remarkable for the greatness of iron per cent. which they have yielded in the furnace, has caused the iron manufacturer to avoid great expenditures where there was a risk, and stick to that which is certain; at the same time, there has been a constant hope that some of these easily accessible ores would prove of sufficient purity to make Bessemer pig, and there has been put out, at various times, statements to that effect.

There is no doubt that there are many isolated pockets of brown hematite which are very low in phosphorus, but it is almost a positive certainty that no great bodies exist which are low enough in phosphorus to make Bessemer pig iron. I know of beds of brown hematite, in one part of which there can be selected specimens very low in phosphorus, low enough by analysis to be a Bessemer, but, at the same time, in a few feet from where those specimens can be selected, the ore runs up far beyond the Bessemer limit. I know of beds of ore which have been sold on analyses of such specimens, and the purchasers were greatly disappointed in actual smelting. As a rule, the blacker colored a brown hematite is, the more apt it is to have a large quantity of phosphorus, and the lighter colored its brown tinge the less of that injurious material it is likely to contain. As a general rule, siliceous brown ores have less phosphorus than rich non-siliceous ores.

The fossil ores all contain too much phosphorus for Bessemer ore, though there is a variety which oxidizes to a yellow color, and has a yellowish red streak which has much less phosphorus than the general average. I have seen in Alabama a vein of this character of ore, which, by analysis, was a Bessemer ore, but I did not think it would continue so deep under the ground. The analysis of surface specimens around Bessemer showed that those ores were thus pure, and I have not seen any analysis from lower levels. It is very sure to assume that no ore suitable for making Bessemer pig can be found in quantity outside of the area of the azoic and metamorphic rocks.

Five specimens from the same bed of brown hematite show the following variation in amount of phosphorus:

1.	2.	3.	4.	5.
0.22	0.181	0.192	0.438	0.56

From another series of analyses, both from same bed:

Iron	53.71	59.60
Phosphorus	1.46	0.36

An ore from a very extensively worked mine is recorded as having 0.018 of phosphorus, which would make it a Bessemer ore, yet it is notorious that the furnace using that ore has never made any Bessemer pig iron. The ores used at Tecumseh (Ala.) Furnace are recorded as varying from 0.072 to 0.710 of phosphorus. The ores used at Shelby Furnace show a range in phosphorus of from 0.059 to 0.559.

It will thus be seen that with this wide range in quality of ores, all from the same bed, that there is very little possibility of obtaining from any bed of brown hematite, an ore running evenly enough to make Bessemer pig. Yet it has been frequently announced as being made at several different furnaces in Alabama. Any ore containing only 50 per cent. of metal and five one-hundredths of phosphorus will not make Bessemer pig. It would not be fully safe to expect to get Bessemer pig iron from any ore containing only 50 per cent. of metal, if that ore had over three one-hundredths of phosphorus. The extreme limit of phosphorus in Bessemer pig is one-tenth of one per cent., and less is much the best.

Not a great while ago, a furnace in Alabama working a very pure and rich brown hematite, announced that they were making Bessemer pig. Mr. Curry, of Carnegie Bros. & Co., went to the furnace, saw their analyses and bought 2,000 tons of pig. In practical work it proved to be uneven in quality and could not be relied upon as a base for the manufacture of Bessemer steel.

The specular ore from near Cartersville, Ga., analyses:

Silicon	27.53
Iron	45.63
Phosphorus	.193

A considerable quantity of this ore was worked at Rockwood, and yielded a pig iron containing .27 of phosphorus, 94.35 of iron, with 5.38 of silicon. A large series of analyses of Shelby pig irons made from the ore we have noted, ranged from 0.16 to 0.61 of phosphorus.

It may be very safely asserted that there never has been any quantity of "Bessemer pig" made in the Southern States. The Roane Iron Co. made a contract with the owners of the Cranberry Co., for 50,000 tons of ore per year. The Roane Iron Co. worked it up at Rockwood. The steel-making world knows the result. With all Capt. Chamberlain's excellent financial management, and Mr. Duncan's practical work at the furnace, there was never produced at that furnace, even from Georgia ores, a first-class Bessemer pig iron.

The above analysis of these ores show that they are low in phosphorus, but lean in iron. Now some one's idea was that by mixing this ore with the Cartersville low grade ore, that a Bessemer pig, or near its equivalent, could be made. The mixture was a failure. The steel of the South is to be derived from the basic process. Of this more anon.—[Henry E. Colton, in Chattanooga Tradesman.

A Problem for Sheet Iron Manufacturers.

Sheet iron manufacturers who are anxious to see the tin plate industry established here are keenly alive to the fact that foreign methods should be improved upon. They assert that in this direction lies a most fruitful field for inventors. The system of rolling the sheets in packs to secure the requisite gauge has so many disadvantages that millmen should long since have devised something more rapid, more certain in its results and more economical in labor. In this part of the process lies the key to successful competition by American makers, even at present rates of duty. The Norton process of rolling liquid steel into sheets covers this point exactly, but months or years of anxious experimenting may be necessary to develop the apparatus in all of its parts so as to secure mechanical and commercial success. But there are always two ways of doing anything, and some of our bright millmen should certainly be equal to the task of inventing a process of rolling cheaply thin gauges of iron and steel. Continuous rolls might possibly accomplish the purpose, and some sheet manufacturers suggest experiments in that direction. It is certainly not to the credit of sheet metal rollers that, in this day of progress in rolling other products, they should still pursue the methods employed 50 years back. The labor of eight to ten men should yield more than two tons per turn of tin plate gauges.—[Iron Age.

Aluminum in Steel.

The influence of aluminum in steel of high carbon is to turn the carbon combined into graphite, and destroys the hardening action of the carbon in tool steel. Aluminum in this sense softens steel. In structural steel of 20 per cent. carbon a small amount of aluminum, up to one per cent. increases the tensile strength without, to any great degree, decreasing the ductility. By its aid a higher tensile strength can be obtained in thick sections of steel which have been subjected to but little work, than can be otherwise obtained; although aluminum with considerable quantities of graphitoidal silicon have been added to steel, no graphitoidal silicon has been found in the steel afterward, it being all found in the amorphous or combined state in the resulting steel. The influence of aluminum also is to lower the melting-point of the steel, and in this way make it more fluid. Its influence, also, is to make the ingots of steel more solid and free from blow-holes. It can be most advantageously used in proportions of from one-tenth to three per cent. of aluminum. —[London Ironmonger.

THE EGAN COMPANY—THEIR NEW BUILDINGS AT CINCINNATI, O.

The cut we present to our readers on this page is the one we promised in a previous issue, having been specially prepared for this journal. These buildings of the Egan Co., of Cincinnati, O., represent a growth without parallel in the history of wood-working manufacturers, and it is but the natural sequence of a policy that has been inherent and progressive with the steady march and advance of time and labor-saving machines of the last two decades.

This great concern are the originators and designers of the many tools which brings the cost of manufacture down to its lowest point, and they have been diligent and aggressive to such a degree that scarcely a hamlet, village or city in this broad land but what have some of their machines in daily operation.

Commencing with a very small shop on this spot but a few years ago, they have grown by degrees to their present proportions. To reach this end, their aim has been to build only the best at moderate prices. This the trade wanted, and appreciated, too, and they have so studied the wants of machinery users that to-day their tools stand without superiors, and are by many considered the standard in every section of this country, and all parts of the world.

That they have been successful one can readily see, and they claim the secret of this success lies in making nothing but the best work,the use of only the best materials and the most modern conveniences in the manufacture of all their productions. The recent purchase of a valuable piece of property immediately adjoining their present large buildings gives opportunity for the erection of a new addition, to be completed in a few months, which will make a battery of steel boilers. The electric lights from their own dynamo give plenty of light in the dark days of Winter.

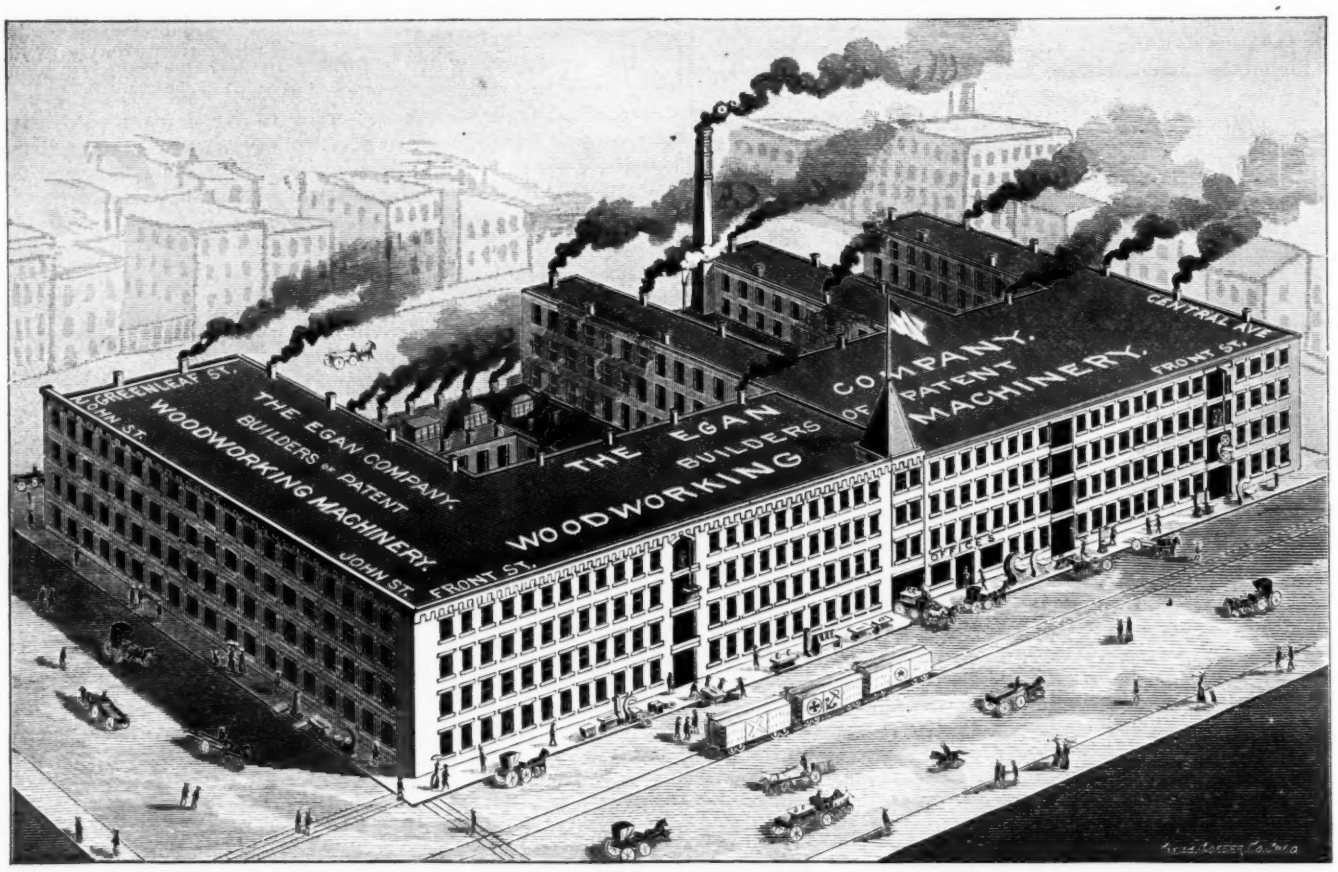
A visit to this concern in a short time will be an interesting study to the mechanic, and to those interested in the working of wood by machinery, for every known appliance will be and is now used in the various processes of building machines to bring them up to the highest standard.

The offices are finished in natural woods, and furnished with fixtures of modern finish and style. The shipping department will now have room for increased dispatch, every possible facility having been added for packing and loading. A switch is provided whereon cars can be shunted to a position to receive shipments intended for every section. This feature alone assures every customer that his or their orders will have prompt attention in this direction. The location of this plant is in very close proximity to every depot in the city, and is considered most favorably situated in this regard for manufacturing purposes.

The Egan Co. claim to build the largest and most complete line of wood-cutting machinery in the country, and that every machine turned out is a marvel of excellence in all particulars; and, to maintain the standard, thoroughly test every machine on the work it has to do before sending it out. We would advise all interested in wood-working machinery of any kind, desiring further information, to address the Egan Co., Nos. 135 to 155 West Front s reet, Cincinnati, O., who will cheerfully respond to any request.

New Form of Electric Battery.

A novel and simple form of electric battery has recently been invented in Italy. As described in the *Rivista Technica*, *Science* says it consists of conical



THE EGAN COMPANY—THEIR NEW BUILDINGS AT CINCINNATI, O.

his the largest plant in this country specially devoted to the building of wood-working machinery.

The buildings cover a square in the heart of the business portion of Cincinnati, have a frontage of 360 feet, a depth of 100 feet, all of brick, are four stories high, and give employment to nearly 400 workmen, and 150 in the foundry near by. Their capacity and facilities will be doubled.

The demand for their productions has always been up to a high water mark, and their premises too cramped for the convenient prosecution of their business. Their increased floor space affords them also ample room for the building of large tools required by saw and planing mills, car builders and railroad shops, for which, of late, there has been such a vigorous demand.

The equipment of this enormous concern will be remarkable, in that it is and will be of the most modern type, and much further advanced than any of a similar character, being composed of tools made by the best makers, capable of doing the best work with the greatest efficiency.

Every department is organized and systematized, and arranged with reference each to the other, and under the management of a competent and skillful foreman, having in them the very best mechanics, many of whom have been with them since the origin of the company. The planing-room has in it the largest planing machine in the West—72 inches wide, with a 20-foot bed. Throughout these buildings will be Brown & Sharpe and Pratt & Whitney tools of all kinds and sizes, milling, screw and gear cutting machines, forty planers for planing the iron frame work, universal radial drills, etc. No money has been or will be spared in any direction to make this establishment the most complete in every detail. Every device is used, and every advantage taken, to produce only the very best wood-working machinery that ingenuity, intelligence and skill can devise. The power to drive the machinery will come from a 300 horse-power Corliss engine, the steam being generated from

vessels of cast iron and porous earthenware, with nitric and sulphuric acid An iron cone is placed point downward in a stand and is partly filled with strong nitric acid. Into this there is placed a cone of porous earthenware containing dilute sulphuric acid. Then follows an iron cone surmounted by an earthenware one, and so on in a series, each vessel containing its respective acid. It follows that the inner surface of each iron vessel is bathed in nitric acid and becomes passive, acting the part of platinum or carbon in an ordinary cell. The outer surface is attacked by the dilute sulphuric acid, and takes the place of the zinc. There are no connections to make, the simple building of the pile putting all the parts into union. The earthenware cones are eight inches in diameter and four inches in height, and contain 550 c cm. of 10 per cent. sulphuric acid solution. The iron vessel contains 110 c. cm. of nitric and sulphuric acids, the latter being three times the volume of the former. Sixty elements, arranged in two piles, have a resistance of 10½ ohms, an electromotive force on open circuit of 81 volts and on closed circuit of 45 volts, with a current of $4\frac{4}{10}$ amperes. After five hours the difference of potential falls to 28 volts, and the current to $2\frac{7}{10}$ amperes.

LIQUID glue possessing great resisting power, and particularly recommended for wood and iron, is prepared, according to Hesz, as follows: Clear gelatine, 100 parts; cabinet makers' glue, 100 parts; alcohol, 25 parts; alum, 2 parts; the whole mixed with 200 parts of 20 per cent. acetic acid and heated in a water-bath for six hours. An ordinary liquid glue, also well adapted for wood and iron, is made by boiling together for several hours 100 parts glue, 260 parts water and 16 parts of nitric acid.

A PITTSBURGH firm has orders from Portugal for shovels, etc., since the unpleasantness with England.

PAPER SUBSTITUTES FOR IRON, STEEL AND WOOD.

Paper is now made to serve for steel and iron. When strong fibre is used it can be made into a substance so hard that it can scarcely be scratched. Railroad car-wheels are made of it more durable than iron. A store in Atlanta, Ga., has been built entirely of paper. The rafters, weather-boards, roof and flooring are all made of thick, compressed paper boards, impervious to water. On account of the surface of the paper being smooth and hard it can not catch on fire as easily as a wooden building. It is found warm in cold and cool in hot weather.

The Breslau fire-proof chimney has demonstrated that cooking and heating stoves, bath tubs, and pots, when annealed by a process that renders them fire-proof, become more lasting than iron and will not burn out.

Black walnut frames are made of paper and so colored that no one can tell them from the original wood. A paper piano has lately been exhibited in Paris. The entire case is made of compressed paper, to which is given a hard surface and a cream-white, brilliant polish.

An Italian monk has succeeded in constructing an organ where the pipes are made of paper pulp. It has 1,400 pipes of various sizes. The American Cotton-seed Oil Trust is now running a mill for making paper from the hulls remaining after all the oil has been squeezed out of the cotton-seed. The trust is contemplating the erection of a 100-ton mill for the same purpose. These hulls have heretofore been considered worthless.

A new mill for the manufacture of paper from moss has been recently established in Sweden. Paper of different thickness and pasteboard made of it have already been shown, the latter even in sheets three-quarters of an inch thick. It is as hard as wood and can be easily painted and polished. It has all the good qualities but none of the defects of wood.

The pasteboard can be used for door and window frames, architectural ornaments, and all kinds of furniture. The ceiling of the Assembly Chamber at Albany, N. Y., is made of papier mache. It is a model of its kind, and appears so like marble as to deceive the most expert eye. The latest idea is to use paper instead of wood for lead pencils, by using a patent preparation by which it can be cut as easily as the softest wood.—[Boston Transcript.

Iron Ship-Building in Bath.

Preparations for building the two United States gun-boats at Bath are already under way. Some of the piles which are to serve as a foundation for the blocking which will support the gunboats have arrived, and a crew are driving them into place. One thousand piles must be set, and the work will occupy several weeks. The appliances for manipulating the metal for the vessels are being constructed, and iron ship-building may be said to have been actually begun in Maine. At the foundry of the Bath Iron Works the moulds for the floor plates are being made. These are thick plates of iron, five feet square, filled with square holes for the insertion of stout pins. Sixty of these plates will be cast and then bolted firmly together, forming a perfectly plain iron floor, containing 1,500 square feet. When an iron frame is to be shaped, the hot metal is placed on the floor and bent against pins set up in these holes to about the right curve, then wedges are inserted between the frame and pins are driven until the iron takes the shape required. In this way the exact line is obtained, the frame is perfectly true, and when cool, will be ready to go into position. These floor plates will all be completed by the time the iron tool shop is erected, and will then be put in position. They are also making the castings for a powerful punch, which will be used to perforate the steel plates which are to "plank" the hull. This will be more powerful than any now in Bath, and will be able to handle the gunboats' coverings with ease.—[Lewiston (Me.) Journal.

An Important Transfer.

On Saturday, April 19, an important deal was consummated at Salem, O., in the reorganization of the Silver & Deming Manufacturing Co., one of the largest and most substantial concerns of that city. The interests held by the Silver family were purchased by the Demings and associates, the former retiring to continue the manufacture of ensilage and feed cutters, carriage makers' and blacksmiths' tools, butchers' tools, etc., under an independent organization, and the Demings taking the present extensive works and continuing the exclusive manufacture of iron pumps and hydraulic machinery, which has here tofore constituted three-quarters of the business of the concern. The Silvers will at once erect a new factory, and will give employment to fifty or sixty men. The Demings will reorganize on the basis of $150,000 capital stock, and will employ upwards of 150 men. The principal parties concerned in the latter organization are: John Deming, W. F. Deming and W. L. Deming, of Salem; Wm. S. Deming, of Ashtabula county; Joel S. Bonsall, Andrew Potter and A H. Harris, of Salem; C. W. Kirtland, of Poland, O.; W. B. Henion, of Chicago. The Deming Co. will increase their line of manufacture and put their works in shape for carrying on an extensive business. They will soon issue a new catalogue, which can be had on application.

State Boiler Inspection.

The State Bureau of Boiler Inspection in Pennsylvania is a prosperous institution, and has done a great deal of good work during the past year. The recent report of the bureau shows that the number of steam boilers inspected and approved by it, in 1889, was 3,026, and inspection certificates were issued for 2,554. The total number of boilers erected in the State during the year was 5,719. The chief of the bureau states that only one boiler of those under its direct espionage, since its organization, has exploded. This record is so excellent that it should stimulate equally successful inspection in other States than Pennsylvania.—[Chicago Journal of Commerce.

THE Manchester ship canal will be finished in a year.

INDUSTRIAL SUMMARY.

New Enterprises:—

The Middlesbro (Ky.) Town Co. are interested in a $200,000 steel car works, reported to be erected there.

The Newton Machine Co., Saginaw, Mich., has filed articles of association, with a capital stock of $30,000.

The Graham Vise-Wrench Co., with a capacity of 500 wrenches weekly, will begin operations in Buffalo shortly.

H. C. Gilbert and others, of Terra Haute, Ind., will soon erect a $50,000 foundry and machine shop at Sheffield, Ala.

The Elk Valley Coal & Iron Co. has been incorporated at Knoxville, Tenn., by J. S. Lindsay, L. F. Harris, S. C. Baird, and others.

The Chattanooga Southern Manufacturing Co. has been incorporated, to manufacture agricultural implements at Chattanooga, Tenn.

The Western Furnace Co., of Manistique, Mich., has been incorporated, with a capital stock of $100,000, to erect and conduct a blast furnace.

The New York City Bolt & Nut Co., Limited, 35 Desbrosses street, New York City, has been incorporated, to manufacture machine bolts and nuts.

Walton, Wentworth & Hunter, composing the American Bridge & Iron Co., of Roanoke, will organize a $200,000 stock company to conduct the business of the same.

The Cook Pipe, Wrench & Tool Co. has been incorporated at Livermore Falls, Me., with a capital stock of $9,500. Clinton Newman is president, and S. S. Lacklin, secretary.

The Clifton (Va) Forge Co. has been organized with W. H. McCormick, of Chicago, Ill., president; John D. Crowle, of Staunton, vice-president; and S. B. Allen, of Staunton, secretary.

The Red River Bridge Co. has been incorporated at Denison, Tex., by B. F. Colbert, J. B. Munson, W. B. Newman and others, to build a bridge over the Red river at Denison. The capital stock is $40,000.

A company has been organized at Baltimore, Md., by S. E. George, J. C. Gittings, Howard Cassard and others to construct ships after the models of R. M. Fryer, of Round Bay, Md.; capital stock, $50,000.

The Roanoke Domestic Ice Machine Co. has been organized at Roanoke, with W. P. Huff, president; J. K. Simmons, vice-president; W. M. Wellford, secretary and treasurer, to erect a plant for the manufacture of a patent ice machine.

The Baltimore Cigarette Machine Co. has been organized at Baltimore, Md., to manufacture the Luddington cigarette machine, by P. H. Woodrum, of Roanoke, W. Va.; Charles Marshall, J. M. Heiskell and others, of Baltimore; capital stock, $100,000.

The Cochran Ore Co., with a capital stock of $30,000, and privilege to increase the same, has been incorporated at Rochmart, Ga., by Gordon McKay, of Newport, R. I.; C. A. Henderson, of Brooklyn, Mass.; T. B. Warner, of Cincinnati, O., and others.

The Bailey Oven Co., at Portland, Me., formed for the purpose of manufacturing furnaces and baking and heating ovens, has a capital stock of $300,000. The officers are: president, Russell C. Elliott, Somerville, Mass.; treasurer, George P. Bailey, Mansfield, Mass.

Through the energy and enterprise of S. E. Hart, Thomas Lyons and Judd Branyan, Kent is to have another industry in the way of a first-class foundry. Ground has been broken and the work of erecting the building is now going on. The main building will be 30x40 feet, with cupola capacity of five tons. —[Bulletin, Kent, O.

Recent Illinois incorporations: McClay Vestibule Car Co., Chicago, to manufacture and purchase vestibule and other cars; capital, $1,000,000; incorporators, Fred J. Hoyt, John McClay, Leslie Malone.—Barrows Manufacturing Co., Rockford, to do a hardware manufacturing business; capital, $50,000; incorporators, J. L. Norton, E. F. Barrows and W. M. Goss.—Tujunga Water Co., Chicago, to construct systems of water works for municipal and private corporations; capital, $3,000,000; incorporators, G. W. Huddleston, F. C. Jocelyn and J. M. Gartside.—A. Y. Mining Co., Chicago, to do a mining business; capital, $60,000; incorporators, H. F. Miller, John W. Cole and Fred Bell. —Favorite Manufacturing & Supply Co., Chicago, to manufacture sewing machines; capital, $10,000; incorporators, W. W. Charles, P. M. Snyder, John H. Grant. -Iroquois Furnace Co., Chicago, to manufacture pig iron, rolled iron and steel; capital, $500,000; incorporators, Robert D. McFadden, Richard Gardner, Henry A Gardner.—Collinsville Electric Light, Heat & Power Co., Collinsville; capital, $25,000; incorporators, Louis Lumaghi, George Hadfield, T. J. Thomas.—Novelty Can & Stamping Co., Chicago, to manufacture tin cans capital, $40,000; incorporators, Thomas H. Colman, E. J. Hamel, H. S. Killen. —Belleville Steel Co., Belleville, to manufacture steel products; capital, $40,000; incorporators, R. W. Waugh, W. W. Waugh, I. Iameysenburg.—H. W. Lehman Steel Car Co., Chicago, to manufacture railway cars and supplies; capital, $50,000; incorporators, T. W. Harvey, G. L. Harvey, A. M. Tanner.— Freeport Hammer Co., Freeport, to manufacture hammers; capital, $200,000; incorporators, R. H. Mill, Charles C. Hanford, Alfred Zaff.—National Sulphur Co., Chicago, to do a mining business: capital, $10,000,000; incorporators, E. K. Wilson, J. M. Drake, James R. Doolittle.—Weber Furnace Co., Chicago, to manufacture furnaces; capital, $100,000; incorporators, Charles Desmond, R. G. Monroe, S. L. M. Monroe.

Enlargements, Additions, Removals, Etc.:—

The Roane Iron Co., Rockwood, Tenn., contemplate erecting another iron furnace.

The Moundsville (W. Va.) Mfg. Co. intend enlarging their foundry and machine shops.

Cruger & Pace, Albany, Ga., will add a machine shop to their manufacturing plant.

The Ross-Meehan Brake Shoe Foundry Co., Chattanooga, Tenn., will, it is

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S. E. BARRETT MFG. CO., 70 La Salle St., Chicago, Ill.

reported, erect an addition to its foundry, to be 52x104 feet, and put in a new cupola.

The Union Iron Works, Erie, Pa., are adding a 60x130-foot building to their plant.

The Chalfant Shelf Hardware Co. will erect two large shops and a foundry at Lancaster, Pa.

The Brinkley (Ark.) Car Works & Mfg. Co. will put in new boilers and additional machinery.

The Standard Pipe & Steel Co. are contemplating erecting pipe and steel works at Newport, Ky.

It is reported that the foundry of Newton Colbert, at Fredericksburg, Va., may be removed to Bristol, Tenn.

The United States Rolling Stock Co., Decatur, Ala., will rebuild its shops, reported last week as being burned.

The Odell Hardware Co., Greensboro, N. C., are contemplating an addition 150 feet deep, and four stories high.

The Hollands Mfg. Co. have purchased a site at Erie, Pa., on which to erect a machine shop, to be completed by July 1.

The Haile & Frost Mfg. Co., Hinsdale, N. H., will equip a machine shop. It will be under the management of George W. Lewis.

The Oriskany Malleable Iron Works, at Oriskany, N. Y., are to be enlarged. The addition will increase the force from 90 to 150 men.

The Safety Signal Lantern & Mfg. Co., of Covington, Ky., has increased its capital stock to $125,000, and will enlarge the plant.

The Cleveland Malleable Iron Co. will erect a brick addition to their works 72 feet wide, 149 feet long and 16 feet high, to cost about $4,400.

R. W. Barrett, of Illinois, has, it is reported, purchased the plant of the Bristol (Tenn.) Foundry & Machine Co., and will enlarge and operate same

The Birmingham (Ala.) Bridge & Bolt Works recently purchased by R. H. Towers, will probably be moved to Avondale, Ala., and enlarge and new machinery added.

Lexington, Ky., has raised nearly $50,000 for the purpose of bringing to that city the Enterprise Foundry, of Mt. Sterling, Ky. The works would give employment to about 100 men.

An addition 50x70 feet to the Eagle Iron Works, corner of South Main and Pine streets, is now in the course of erection, and when completed will extend these already large works entirely out to Pine street. The new building will be of brick, and will be pushed to completion as rapidly as possible. Hon. Geo. B. Sennett, proprietor of the works, resides in Erie, the business here being under the efficient management of Mr. E. P. Cullum.—Messrs. Barrett Bros., whose machine shop on Arch street was destroyed by fire a short time since, will rebuild at once. They have purchased fifty feet of ground, adjoining their property on the west, and will erect a brick building with a frontage two stories in height and covering all their ground.—The Phœnix Iron Works is turning out $1,000 worth of finished product per day.—[Meadville (Pa.) Journal.

Furnaces and Works Starting Up:—

It is stated that the Glenn Boiler Works are to be started up again at Minneapolis, with a number of local capitalists back of the enterprise, and Col. Glenn in charge.

The axle forge situated near Waverly, N. Y., has been leased for a term of years by G. H. Stinson, an iron manufacturer of Buffalo, who will start up the works at once, giving employment to about 50 men.

After over three years' idleness, the large rolling mill at Columbus, O., has been put in operation by Cartwright, McCurdy & Co., of Youngstown. When in full operation, the works employ about 300 hands.

General Industrial Notes:—

The city council of Waterloo, Ia., has passed a resolution exempting the plants of all manufacturing companies of a capital stock of $20,000, which may be organized in the future, from all municipal taxes for a period of ten years.

F. J. Reinhard, of Columbus, auditor of Franklin County, will receive proposals until April 30 for two bridges, one to be built over the Ollutangy river at Lane avenue, in Columbus. The superstructure will be of steel, with a 400-foot span and a 24-foot roadway. The bids will be received for the substructure and superstructure separately. The second bridge will be across the Scioto river. The superstructure will be of steel, with a 300-foot span, a 24-foot roadway and two sidewalks 6 feet wide each.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 13th day of May, 1890, for all the labor and materials required to put in place all the gas piping in the United States Custom House, etc., building at Galveston, Texas.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 13th day of May, 1890, for all the labor and materials required to fix in place complete the low temperature, hot water, heating and ventilating apparatus for the United States Post Office, etc., building at Springfield, Ohio.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 15th day of May, 1890, for all the labor and materials required to fix in place complete a low-pressure steam heating and mechanical ventilating apparatus, for the United States Court House and Post Office, building at Montpelier Vermont.

Grant C. McNeil, Akron, Ohio, manufacturer of balanced charging barrows, steel wheelbarrows, etc., writes: "I have shipped orders this month to New Mexico, Texas, Alabama, Maryland, Philadelphia and Conneticut, besides many nearer home. Trade is growing fast enough to compel me to double my shop. My barrows are winning their way, and satisfying their users everywhere."

The Howell Wheel Co., Covington, Ky., manufacturers of steel wheels for agricultural implements, wheel-barrows, etc., have let contracts for the erection of an extensive building, 400x85 feet, in addition to their present plant. This concern was only organized last July, and have been running night and day to fill orders, but, finding such a large demand, have been compelled to erect new shops.

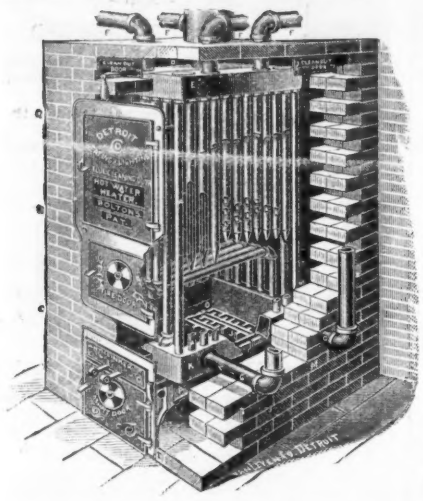
Mr. F. H. Holbrooke, Secretary of the Board of the Trade at Muskegon, Mich., writes us that the Chase Piano Co. has commenced the erection of their large factory. The Sargeant Roller Chair Co.'s factory is well under way. The contract is let for the erection of a large flouring mill—roller process, also for a large rolling mill. At least ten other institutions are contracted with or negotiations have reached that stage where they are reasonably certain of coming. There is a strong feeling in real estate and many sales, but not at fictitious prices.

We are in receipt of the "Industrial Advantages of Detroit," which points out the superior advantages of Detroit as a manufacturing city, also noting in brief the leading and enterprising manufacturers of said city, among which we note W. J. Burton & Co. as being leaders in the manufacture of galvanized iron cornices and architectural sheet metal work for all classes of buildings. They are also the manufacturers of the famous "Eastlake metal shingle" for roofing and siding, which have gained the favor they deserve in building and roofing specifications for residences, schools, churches and all exposed buildings. Messrs. Burton & Co. are young and enterprising business men, who have already gained a reputation in the business world not usually attained by much older firms, which has only been acquired by persistent and able management, square dealings, etc., and would heartily recommend them to any one needing goods in their line, as being a reliable firm to deal with.

New Basic Lining for Bessemer Converters.

The Pottstown Iron Company, of Pottstown, Pa., have acquired the patent for the United States for the basic lining for Bessemer converters invented by Ernest Bertrand, of Kladno, Bohemia. The method is somewhat similar to what has been done with acid lining, viz.: to grind the material, in this case dolomite or limestone, mix it with water, and with or without an adhesive substance, like molasses, form it into bricks. The latter are burned at a white heat for about forty-eight hours in a kiln. These burned bricks are again ground and mixed with 10 to 12 per cent of tar, the product being used to ram up in the converter. Bertrand claims that the preparatory grinding of the stone into brick, the baking of the latter and grinding the burned brick, yield a product more homogeneous than can ever be obtained from the cupola or kiln burned dolomite. He claims, too, greater accuracy of material, because there is always a loss of the fine stuff which must be thrown away because it cannot be freed from cinder.—[Labor Tribune.

BOLTON



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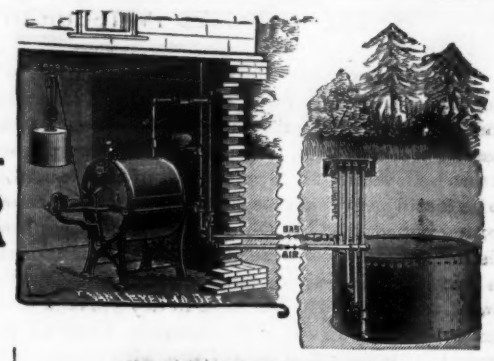

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The Pennsylvania Ship Canal Commission held their regular meeting on the 9th inst. in their room in Pittsburgh, Commissioner Goodwin was present, and the most principal theme of discussion was the report of his surveys from Conneaut Lake West, to the Summit of the proposed canal near the State line. It was believed that at a point west of Conneaut Lake a much lower summit was to be found than that crossed by the old State canal. The survey showed that a route existed near the Ohio State Line 97 feet lower than the old summit. The discovery of this route means the abolishment of at least fourteen locks necessary in crossing the divide between the Ohio River and Lake Erie. Col. Roberts stated that it was the fact that in dry seasons it was sometimes necessary to "pump water" to supply the summit level of the old canal. The difficulty arose in this way: Conneaut Lake, which was supplied by a feeder from French Creek, was the original source of water supply. The canal past along its West side, and for several miles on a level only slightly below the level of the lake. The original intention of the engineers was to dig out the canal in this long summit level so that the waters of the lake could easily flow out at all times into the canal, but from motives of economy the seven feet of desirable excavation was never done. Hence, it resulted that after the lake was slightly lowered its waters would no longer flow into the canal, the canal in the latter part of the season being actually higher than its supplying resevoir, and hence arose the necessity for pumping. Even the small feeder at French Creek was never taxed to more than half its capacity. But now the situation is entirely altered. The Commission will probably never recommend the old route since they have found one so much better. The proposed course, if the Beaver route is adopted, will be thirty miles shorter than the old State canal. Regarding the two routes, the one by way of the Beaver and the other by the Allegheny river, both lead to the same summit. The building of the canal by the Beaver route would have immense commercial advantages, as there are 38 blast furnaces in the Mahoning and Shenango valleys. This would practically create another source of traffic supply equal to that found in Pittsburgh, or in the language of a member of the commission, would make "two Pittsburghs." Another feature which requires special thought is the depth of the canal and the size of the vessels to be used on this route. The work of the surveys of the commission has been greatly held back by the bad weather, high waters, etc., and it will be some time in May or June before the work is completed. The Beaver route undoubtedly has the preference, and the prospects for the canal passing through the Beaver valley are very good.—[New Castle (Pa.) Guardian.

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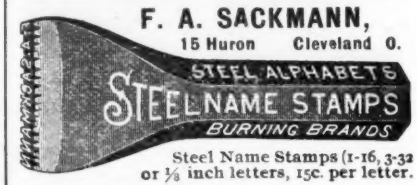

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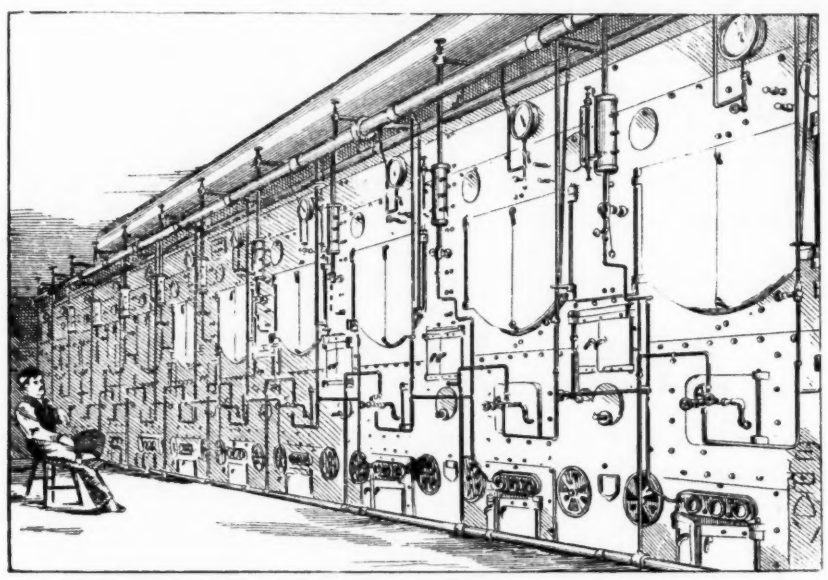

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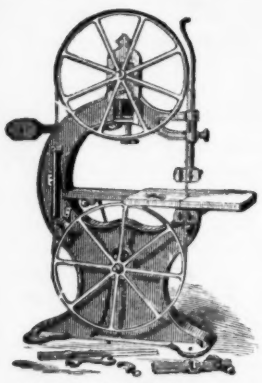

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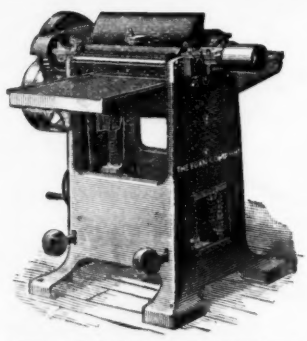

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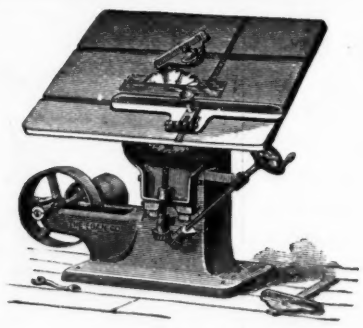

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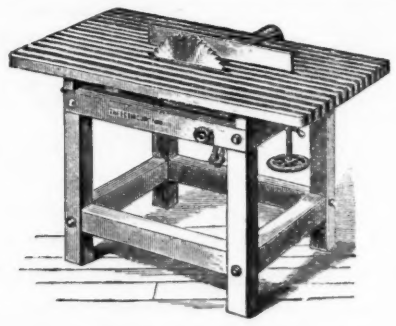

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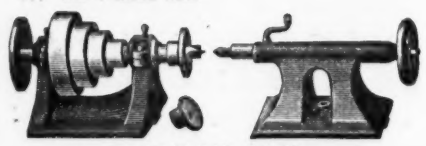

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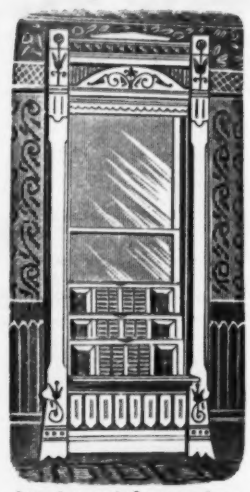

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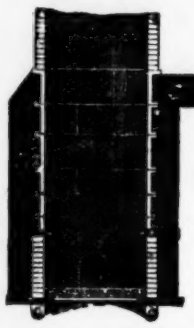

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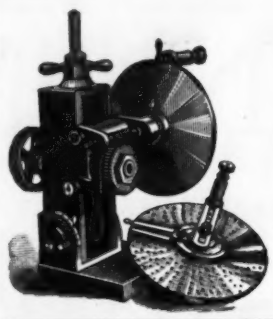

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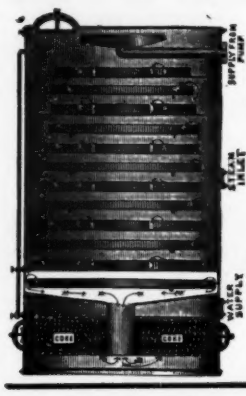

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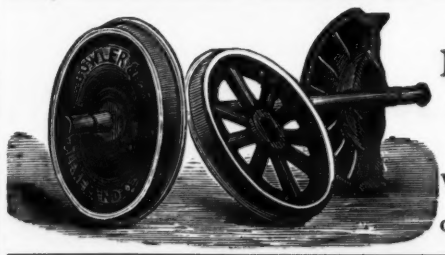
USED BY NEARLY ALL THE RAILROADS



CLEVELAND FOUNDRY.

HEAVY CASTINGS.

ARCHITECTURAL WORK in all its branches.

Car Wheels

With or without axles, Street Railroad Woeels and Track Supplies.

Office 14 Winter St. CLEVELAND, O. } **BOWLER & CO.**

A. WYCKOFF & SON,

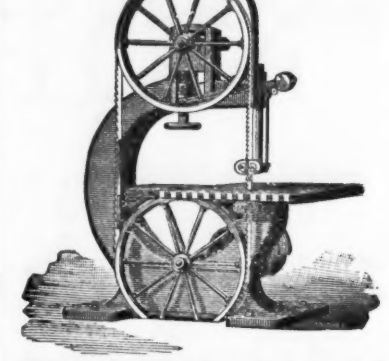
Elmira, N. Y.

Patent Steam Pipe Casing

For Underground Steam Pipes.

Send for Circular and Prices.

Two staves removed to show the lining between the inside and outside staves.



$80 will buy the best No. 1 band saw in th world.
$100 will buy our new No. 2 40" band saw.
$185 will buy our new patent band re-saw ing machine.
$100 will buy the best No. 1 automatic rip-sawing machine. Weatherboarding attachment included, and one saw.
$125 our new No. 2 complete as above.
For further particulars address

STANDARD MFG. CO.,

110-120 Main St., Mt. Carmel, Ill.

HEADQUARTERS FOR

ANIMAL POKES

They prevent animals from breaching or being injured by barbed wire. Best in the market. Recent valuable improvements. Prices low. Factory extensive and reliable. Send for catalogue and price list.

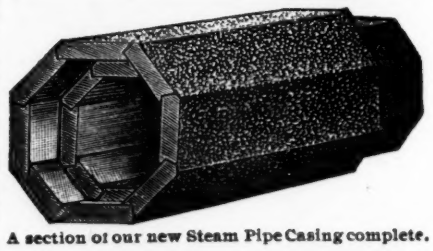
A. W. BISHOP, Berea, O.

The Goodrich Folding Bath Tub.

Greatest Invention of the Age

Complete in all requirements, is Self-Heating and Folding. When not in use occupies space on floor less than two feet square. Can be used in any ordinary bed-room. For full descriptive circulars and prices address

Mich. Bath Tub Co., Homer, Mich.



A section of our new Steam Pipe Casing complete.

Two staves removed to show the lining between the inside and outside staves.

Steam Jet Pumps,	-	**From $4.00 up.**
Automatic Injectors,	-	" **$5.00 up.**
High Lifting Injectors,		" **$6.00 up.**
Shafting, Hangers,	-	- " **$1.00 up.**

COUPLINGS, BOXES, COLLARS, ETC.

Write for Circulars, Etc.

COLUMBIA INJECTOR CO., CLEVELAND, O.

THE SWEET & CLARK CO., Marion, Ind.

Manufacturers of REFINED AIR FURNACE MALLEABLE IRON.

Superior advantages on account of Natural Gas Fuel. Also manufacturers of Curry-Combs, Hardware and Saddlery Hardware Specialties. ☞Write for Price List and Catalogue.

CLEVELAND ROLLING MILL CO.,

MANUFACTURERS OF

BESSEMER STEEL RAILS,

Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel O Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

STEEL WHEELBARROWS

FOR

Rolling Mills.

GRANT McNEIL,

AKRON, O.

Send for barrow circular.

IRON AND STEEL MARKETS.

PIG IRON.

CLEVELAND (f. o. b. cars, net cash): Bessemer, $17 80; No. 1 Foundry, $17 80; No. 2 Foundry, $16 80; No. 1 Gray Forge, red short, $15 80; No. 2 Gray Forge, neutral, $15 30; No. 1 American Scotch, $17 80; No. 2 American Scotch, $16 80.

CHICAGO (reported by Messrs. Rogers, Brown & Co.): Southern Coke No. 1. Foundry, $16 00 @16 50; Southern Coke No. 2 Foundry, $15 50 @16 00; Southern Coke No. 3 Foundry, $15 00 @15 50; Southern Coke No 1, Softeners, $15 50 @16 00; Southern Coke No. 2, Softeners, $15 00 @15 50; Ohio Silveries No. 1, $18 50@19 00; Ohio Silveries No. 2, $17 50@ 18 00; Ohio Strong Softeners No. 1, $19 75@20 25; Ohio Strong Softeners No. 2, $18 75@19 25; Lake Superior Charcoal Nos. 1 to 6, $21 00@21 50; Tennessee Charcoal No. 1, $20 00@20 50; Tennessee Charcoal No. 2, $19 50@20 00; Southern Standard Car Wheel, $24 50@25 00; Tennessee Standard Car Wheel, $21 00@21 50; Hanging Rock Standard Car Wheel Cold Blast, $26 00@28 00; Hanging Rock Standard Car Wheel Warm Blast, $23 00@25 00; Old Car Wheels, $00 00@00 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $14 75@15 25; Southern Coke No. 2 Foundry (new classification), $14 25@ 14 75; Southern Coke No. 3 Foundry (new classification), $13 25@14 25; Grey Forge, $13 25@13 75; White and Mottled, different grades, $13 00@13 50; Silver Grey, different grades, $13 75@14 75; Southern Charcoal No. 1 Foundry, $17 00@18 50; Southern Charcoal No. 1 Mill, $15 75@16 75; Southern Car Wheel, Standard brands, $23 00@24 00; Southern Car Wheel, other brands, $18 50@21 00; Hanging Rock Coke No. 1 Foundry, $16 50@17 50; Hanging Rock Charcoal No. 1 Foundry, $20 50@ 21 50; Hanging Rock Cold Blast, $22 00@24 00; Hanging Rock Warm Blast, $00 00@00 00.

LOUISVILLE (reported by Hall Bros. & Co.): HOT BLAST FOUNDRY—Southern coke No. 1, $15 00@15 50; Southern coke No. 2, $14 75@15 00; Southern coke No. 3, $14 00@14 50; Mahoning Valley (Lake ore mixtures), $18 00@19 00; southern charcoal, No. 1, $17 50@18 00; Southern charcoal, No. 2, $17 00@17 50; Missouri charcoal, No. 1, $18 50@19 00; Missouri charcoal, No. 2, $18 00@18 50. FORGE—Neutral coke, $ 3 50@14 00; Cold short, $13 25@13 50; Mottled, $12 7 @13 00. CAR WHEEL AND MALLEABLE—Southern (standard brands), $22 50@ 23 00; Southern (other brands), $19 00@20 00; Lake Superior, $22 50@23 00.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $16 00@16 50; Southern Coke No. 2, $15 25@15 75; Southern Coke No. 3, $14 75@15 25; Southern Grey Forge, $14 25@ 14 75; Southern Charcoal No. 1, $18 50@19 00; Southern Charcoal No. 2, $18 00@18 50; Missouri Charcoal No. 1, $18 50@19 00; Missouri Charcoal No. 2, $18 00@18 50; Ohio Softeners, $19 00@ 20 50. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $23 00@24 00; Southern, $21 00@ 24 00. CONNELLSVILLE COKE—East St. Louis, $5 65; St. Louis, $5 80.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $19 50@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $18 50 @00 00; Niagara No. 1, $19 75@00 00; Niagara No. 2, $18 75@00 00; Niagara No. 3, $17 75@00 00; Ohio Softener No. 1, $19 00@00 00; Ohio Softener No. 2, $18 00@00 00; Lake Superior Charcoal, $22 00@00 00; Tennessee Charcoal, $20 50@00 00; Southern Softener No. 1, $17 25@00 00; Southern Softener No. 2, $16 75@00 00; Alabama Car Wheel, $25 00@00 00; Hanging Rock Charcoal, $24 00@00 00.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $21 50@22 00; Lake Superior (coke) Bessemer, $20 00@21 00; Katahdin (Maine charcoal), $26 00 @26 50; Lake Superior Coke, Foundry, all ore, $18 75@19 50; Lake Superior Coke, Foundry Cinder Mixed, $18 00@19 00; Standard Ohio Black Band, $19 00@19 50; Southern No. 1, $17 00@17 50; Southern Gray Forge, $14 75@ 15 25; Jackson County (Ohio) Silvery, $19 00@ 19 50; Old Car Wheel, $20 00@00 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $17 75@18 00; No. 2 Foundry, $16 75@17 00; Grey Forge, $15 50@16 00; White and Mottled, $14 50@15 00; Warm Blast Charcoal, $19 00@22 00; Cold Blast Charcoal $23 00 @29 00; Bessemer, $18 00@18 50.

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $15 00@15 50; Hanging Rock Coke, No. 1 foundry, $17 50@18 50; Jackson Co. Stone Coal, No. 1 foundry, $17 00@18 00; Tennessee Charcoal, No. 1 foundry, $ 8 00@18 50; Hanging Rock Charcoal, No. 1 foundry, $21 00 @22 00. MILL IRONS—Standard Southern Coke grey forge, $13 50@13 75; Standard Southern Coke, mottled $12 75@13 25; Cold Short Southern Coke, grey forge, $12 00@13 50; Strong Ohio Neutral Coke, grey forge, $15 50@16 00. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $22 50@23 50; Tennessee Car Wheel, $20 50@21 50; Lake Superior Car Wheel, $22 00@23 00.

MERCHANT IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 90
4½ to 6 by ⅜ to 1 inch	2 00
1¾ to 6 by 1⅛ to 2 inch	2 30
1¼ & 1⅜ by ⅜ to ¾ inch	2 00
1 & 1¼ by ⅜ to ¾ inch	2 10
⅝, ¾ and ⅞ by ⅜ to ⅝ inch	2 30

Round and Square.

1 to 1⅜ inch	1 90
2 to 2¾ inch	2 10
2¾ to 3¼ inch	2 40
3⅜ to 4 inch	2 90
4¼ to 4½ inch	3 40
4¾ to 5 inch	3 60

Oval.

⅝ to 1¼ inch	2 30
⅝ to ¾ inch	2 50
½	2 70
⅜	3 10

Half Oval and Half Round.

1⅜ to 3 inch	3 00
⅝ to 1¼ inch	2 60
⅝ to ¾ inch	3 20
½	3 40
⅜	4 90

Heavy Band.

1⅜ to 6 by ¼ and 5-16 inch	2 10
1 to 1⅜ by ¼ and 5-16 inch	2 20
⅜ to ⅞ by ¼ and 5-16 inch	2 40
½ to ⅝ by ¼ and 5-16 inch	2 90

Hoops.

1¼ to 4, Nos. 13 to 15	2 70
1¼ to 2, Nos. 16 to 18	2 80
1¼ to 2, No. 19	2 95
1¼ to 2, No. 20	3 00
1¼ to 2, No. 21	3 10
1¼ to 2, No. 22	3 20
15-16, 1 and 1⅛, Nos. 13 to 15	1 90
15-16, 1 and 1⅛, Nos. 16 to 18	3 00
15-16, 1 and 1⅛, Nos. 19 and 20	3 10
15-16, 1 and 1⅛, No. 21	3 20
15-16, 1 and 1⅛, No. 22	3 30
⅞, Nos. 13 to 15	3 10
⅞, Nos. 16 to 18	3 20
⅞, Nos. 19 and 20	3 30
⅞, No. 21	3 40
⅞, No. 22	3 50
13-16, Nos. 13 to 15	3 30
13-16, Nos. 16 to 18	3 40
13-16, Nos. 19 and 20	3 50
13-16, No. 21	3 60
13-16, No. 22	3 70
¾, Nos. 13 to 15	3 40
¾, Nos. 16 to 18	3 60
¾, Nos. 19 and 20	3 70
¾, No. 21	3 80
¾, No. 22	3 90
11-16, Nos. 13 to 15	3 60
11-16, Nos. 16 to 18	3 80
11-16, Nos. 19 and 20	3 90
11-16, No. 21	4 00
11-16, No. 22	4 10
⅝, Nos. 13 to 15	3 90
⅝, Nos. 16 to 18	4 10
⅝, Nos. 19 and 20	4 20
⅝, No. 21	4 30
⅝, No. 22	4 40
⅝, No. 23	4 50

Light Band.

1⅜ to 6 by ⅛ to 3-16 in	2 30
1⅜ to 6 by Nos. 11 and 12	2 40
1 to 1⅜ by ⅛ to 3-16 in	2 50
1 to 1⅜ by Nos. 11 and 12	2 60
⅞ and 13-16 by ⅛ to 3-16 in	2 80
⅞ and 13-16 by Nos. 11 and 12	2 90
¾ and 11-16 by ⅛ to 3-16 in	3 10
¾ and 11-16 by Nos. 11 and 12	3 20
⅝ and 9-16 by ⅛ to 3-16 in.	3 40
⅝ and 9-16 by Nos. 11 and 12	3 50
½ by ⅜ to 3-16 in	3 70
½ by Nos. 11 and 12	3 80

Wagon Box Iron.

⅛ inch, beveled edge, by Nos. 11 and 12	2 90
⅛ inch, " " " 13 and 14	3 10
¼ inch, " " " 11 and 12	3 20
¼ inch, " " " 13 and 14	3 40

Sheet Iron.

No. 10 to 14	2 65
No. 15 to 17	2 80
No. 18 to 21	3 00
No. 22 to 24	3 20
No. 25 to 26	3 35
No. 27	3 45
No. 28	3 55

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 80
C No. 1, " "	3 05
C H No. 1 " "	3 30
C H Flange, " "	4 05
Extra Flange, "	4 55
Solid Fire Box "	5 30

Steel Boiler Plates—1-4 in. and Heavier.

Tank	3 00
Shell	3 40
Flange	3 70
Marine Flange	4 10
Fire Box	4 80

Above includes plates 90 inches wide.

90 to 96 in. wide	⅛c ₶ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1⅛c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ₶s
1 to 2 in. inclusive	09
9-16 to ⅞ in "	09
7-16 to ⅜ and 2¾ to 3 in	10½
3⅛ to 4 in	11
⅜ to 11-16 and 4⅛	10½
⅞ to 6 in	11½
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

	cts. ₶s
2 to 9-16 wide by 2 to ⅝ thick	9

Bessemer and O. H. Steel.

Machinery	base price,	3 00
Tire	"	3 00
Spring	"	3 50
Sleigh Shoe	"	3 00
Toe Calk	"	3 25
Cutter Shoes, tapered and burr.	"	3 25

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

NET TONS	
No. 1 R. R. wrought scrap	$19 00
No. 1 wrought scrap	18 00
No. 1 Machine cast scrap	14 00
Iron axles	24 00
Axle turnings	15 00
Wrought turning (free from cast)	13 00
Cast borings	9 00
Uncut wrought iron boilers	13 00
Steel boiler plates	17 00
Grate Bars	9 00
Pipes and flues (Clean)	14 00
Tank iron	14 00
Hoop and band iron	12 00
Sheet iron	10 00
Wrought drillings	12 00
Malleable iron	10 00
GROSS TONS	
Old iron T rails	24 00
Old steel rails	21 00
Old car wheels	18 50
Old copper	₶ 10
No. 1 H. red Brass	11
Heavy yellow brass	8½
Light yellow brass	6
Scrap Zinc	
Tea Lead	
Heavy Lead	3¼

H. N. HILL & CO.

Manufacturers' Agents' for

BOILER TUBES.
PLATE STEEL.
BOILER RIVETS.
NORWAY IRON RIVETS.
SMOKE STACK AND GASOMETER RIVETS.
BAR IRON.
BAR STEEL.
STEEL AND IRON ANGLES.
SHEET IRON.
SHEET STEEL.
RAILROAD AND BOAT SPIKES.
WROUGHT IRON PIPE AND FITTINGS.
PULLEYS, HANGERS AND COUPLINGS.
BEAMS AND CHANNELS.
STEEL RAILS AND CASTINGS.
GALVANIZED SHEET.
PORTABLE FORGES.
RAILROAD AND MACHISTS' SUPPLIES.

813 PERRY-PAYNE BUILDING,

Telephone 95. CLEVELAND, O.

PITTSBURGH & WHEELING COAL CO.,

MINERS AND SHIPPERS OF

Ohio Steam Coal and Coke.

Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.

Office, 29 Mercantile Bank Building, CLEVELAND, OHIO.

Lake Shipping Point, Lorain O.

IAS. PATTERSON, Sales Agent

DALLIBA, CORRIGAN & CO.,

DEALERS IN

Iron Ore & Pig Iron,

Rooms 716, 717, 718, 719 Perry-Payne Bld'g, CLEVELAND, O.

TUTTLE, OGLEBAY & CO.,

Commission Dealers in

Iron - Ores.

FROM MARQUETTE, GOGEBIC AND MENOMINEE DISTRICTS,

CLEVELAND, OHIO.

J. H. OUTHWAITE. W. G. POLLOCK.

J. H. OUTHWAITE & CO.,

Exclusive attention given to

LAKE SUPERIOR AND MENOMINEE RANGE

Iron Ore.

Perry-Payne B'ld'g, Cleveland, O.

THE CONDIT-FULLER CO.,

Pig and Bar Iron,

CLEVELAND, OHIO.

Pickands, Mather & Co.,

IRON ORE - -

—AND—

- - PIG IRON

Corner Bank and Superior Streets, CLEVELAND, O.

E. C. POPE,

COMMISSION DEALER IN

Iron Ore, Pig Iron

AND METALS.

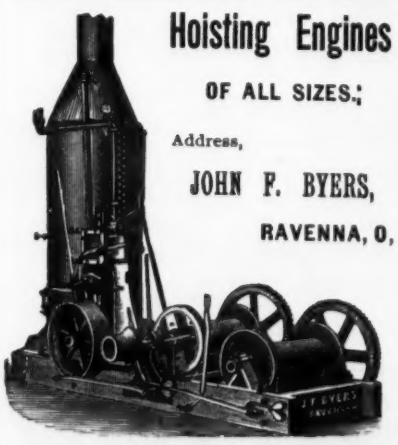
Cleveland, - Ohio.

A FOUNDRYMAN

OF CONSIDERABLE EXPERIENCE in all the details of his trade, desires to attach himself to some firm of Pig Iron Producers, or Brokers, as Selling Agent—traveling or located. Has had considerable experience in the melting and mixing of iron in large quantities. Is well posted on mixtures, and knows the requirements of the Western foundry trade. Address,

PIC IRON,

Suite 75 Citizens' Bank Building, No. 121 La Salle St., CHICAGO, ILL.



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OF ALL SIZES.

Address,

JOHN F. BYERS,

RAVENNA, O.

INDIANA MACHINE WORKS

FORT WAYNE INDIANA

BUILDERS OF

WOOD WORKING MACHINERY

WRITE FOR DESCRIPTIVE CIRCULAR

MACHINERY SUPPLY MARKET.

Anvils.

American ₩ lb 9@10
Wrights ₩ lb 9½

Bellows.

Blacksmiths' { Hill's dis 40 / Bullock's dis 50&10
Moulders' dis 40@40&10
Hand dis 40&10@50

Belting.

Boston Belting Co's standard dis 70@70& 5
" " " extra dis 60&5@60&10
" " " best dis 55
Hoyt's Short Lap dis 45
Cleveland Rubber Co. extra standard dis 60&10
Shultz Raw Hide Leather Belting, single, dis 40
Shultz Raw Hide Leather Belting, double, and Light Double dis 40
Standard, oak tanned dis 55@60
Alexander Brothers' pure oak tanned dis 45

Blowers and Exhausters.

B. F. Sturtevant's dis 20
Boston Blower Co. dis 35
Buffalo dis 35

Borax.

₩ lb 9½@10½

Chalk.

White ₩ gross 50
White Crayon ₩ gross 12@12½ dis 10
Red dis 70
Blue dis 85

Chucks.

Cushman's 4 Jaw Independent dis 45
" Combination dis 40
" Geared Scroll dis 30
" 2 Jaw Brass Workers dis 30
" Drill dis 35
Wescott's Scroll Combination dis 33⅓
" Independent dis 40
" Little Giant Drill dis 30
Horton's Universal dis 40
" Independent dis 45
National Combination dis 40
Sweetland " dis 40
Skinner " dis 40
" Independent dis 45
Almond Drill dis 25
Morse " dis 15
Skinner " dis 30

Cutters and Reamers.

Cleveland dis 10@15
Pratt & Whitney dis 10@15
Standard dis 10@15
Brown & Sharpe, Milling Cutters dis 15
" " Gear Cutters dis 15

Crowbars.

Cast Steel ₩ lb 4
Iron, steel points ₩ lb 3½

Drill and Drill Stocks.

Twist drills dis 50&10
Morse Taper and Straight shank to 1½" dis 50&10
Morse Taper and Straight shank Larger than 1½" dis 25
Drill Sockets dis 25
Standard dis 50&10
Cleveland dis 50&10

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4½c	5½c		2¾c
¼ kegs ₩ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6¼c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co. dis 45@50
H. H. Barton dis 40@45

Emery Wheels.

Detroit dis 55@60
Norton's dis 55@60
Grant dis 55@60
Union Stone dis 60
Sterling dis 60
Celluloid dis 10&33⅓
Northampton dis 55
Crystal dis 65@70
Vitrified dis 60
Vulcanite dis 10&10

Files.

Nicholson dis 60&10@60&10&10
" X. F. dis 25
Kearney & Foot dis 60&10@60&10&10
Black Diamond dis 60&10@60&10&10
Arcade dis 60&10@60&10&10
Disston's dis 65@70
Western dis 70
Stub's dis 25
Grobet's dis 30
Reynolds Bros.' Hand Cut dis 50

Hammers.

P. S. W. dis 40
Atha new list, Jan. 15, 1887 dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3¼	3¼
Hexagon	15¾	11¾	8¾	6	5¾	5¼	5
Washers	9	8	7	5	4½	4¼	4¼

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887 dis 70 &10
Standard Penny Nails, ₩ keg card rate
{ Car lots $2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin dis 60
Brass and Copper dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz dis 72@10&10

Packing, Steam.

Boston Belting Co. dis 60
American Packing Hemp ₩ lb 10@11
Russia Packing " ₩ lb 14
Italian Packing " ₩ lb 13@14
Plumbago Piston ₩ lb 40
Morrison's " ₩ lb 50
Square Flax " ₩ lb 50
Sheet Rubber ₩ lb 12@24
Vulcanite Rubber ₩ lb 8

Picks.

Railroads, 5 to 6 lbs $12 dis 60
" 6 to 7 lbs $13 dis 60

Pulleys.

Iron Pulleys, Walker List dis 45
Medart Pulleys dis 55
Split Wood Pulleys dis 55

Rivets.

Iron, Thousand, list November 17, dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17 dis 50
Copper dis 50@50&10

Rope.

Manilla, ½ inch and over ₩ lb 15¾
Sisal, ½ inch and over ₩ lb 13¾

Sand Paper.

B. A. & Co dis 45@50
H. H. Barton's dis 45@50
New England Flint dis 40@50
Barton's Garnet dis 20

Saws.

Disston's Circular dis 45
" Band dis 20
" Scroll Net
Hack Saw Stubs dis 20
" " Eureka dis 20
" " Star dis 20
Saw Swages Disston's dis 20
Atkins' Cicular Saws dis 50
" Mill, Mulay and Drag Saws dis 40&10
" Wood Saws dis 40&10
" Silver Steel Diamond Cross-cut Saws dis 70c per ft
" Dexter Cross-cuts dis 50c "
" Diamond " dis 30c "
" Tuttle Tooth Cross-cuts dis 25c "
" One-man Cross-cuts dis 32c "
No. 1 Handles dis 23c per pair
No. 6 " dis 16c "
Excelsior Saw Tools $6 per doz
Perfection " $15 "
Detroit Saw Works, Circular dis 50
" " " Band dis 25
" " " Mulay dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron dis 50
Round head iron dis 40
Flat head brass dis 45
Round head brass dis 35
Square Cap dis 65
Hexagon Cap dis 60
Set C. H. C. P. dis 70
Machine, flat head, iron dis 55
Machine, round head, iron dis 50
Bench and hand—
Lag or coach dis 75@75&10
Coach, patent gimlet point dis 75

Shovels and Spades.

Ames' list November 1, 1885 dis 20
Dennis dis 5.25
Hussey & Binns, railroad dis 8.00

Taps.

Cards, Hand and Nut to 2 in dis 50
Carpenters' " " " dis 50
Morse " " " dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps dis 55
Pipe Taps to 2½ in dis 70
Stay Bolt Taps dis 25
Stove Bolt Taps dis 50
Pulley Taps dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅛ lb Balls	21c@29c	
No. 18 " " ¼ and ½ "	18c@28c	
No. 36 " " ¼ and ½ "	16c@27c	
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine)	11½c	
3-Ply " 1 lb Balls	12@12¼c	
3-Ply " 1½ lb Balls	11@11¼c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid Box dis 60
Parker's dis 20@25
Prentiss dis 20
Stephen's dis 25@30
Barrett's dis 30
Miller's Falls dis 40
Merrill's dis 10@15
Howard dis 30
Maneer's machinist dis 50&10

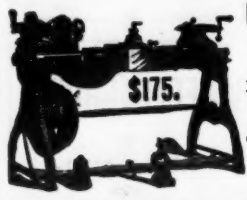
Wire.

New List, Jan. 18, 1884

Brass and copper dis 20@25
Bright and annealed, Nos. 0@18 dis 70&10@75
" " Nos. 19@26 dis 75@75& 5
" " Nos. 27@36 dis 75&10& 5
Coppered Nos. 0 to 18, market list dis 70@70& 5
Galvanized Nos. 0 to 18 " " dis 65&5
Tinned market Nos. 0 to 18 dis 67½
Cast steel dis 50
Tinned Broom Wire dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 dis 75
Annealed Grape, Nos. 10 to 14 dis 75
Stub's Steel Wire regular $6.00@lb dis 30

Wrenches.

Coe's genuine, cash in ten days dis 50
Girard Standard dis 70&10
Agricultural dis 75&10
Mechanics' dis 55&10,& 3
Bemis & Call's Combination dis 35
Donohue's Engineers dis 20&10
Lamson & Sessions Engineers dis 60
Billings & Spencer's Drop Forged dis 10
William's " " dis 10
Alligator " " dis 40



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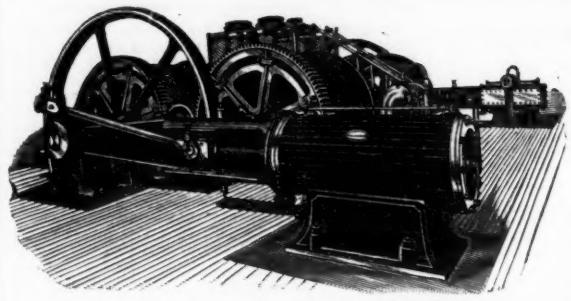

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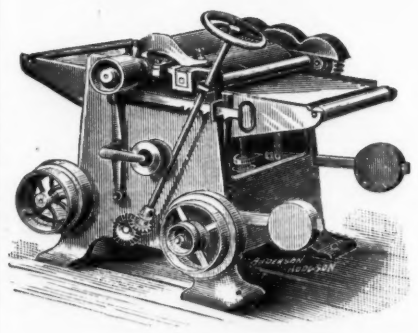
Improved Wood-Working Machinery.



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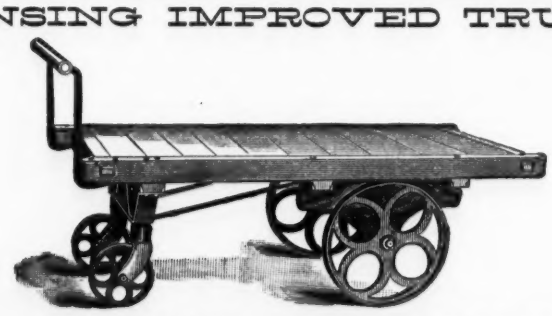

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Augers and Bits.

ommon augers and bits.....dis 70
nell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ℔ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ℔ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $2 75@3 25
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....℔ doz $8 00
Others.....℔ doz $7 00
Full polished.....℔ doz $9 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 70&12½
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 62½
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60&5
Fast joint, broad.....dis 55&10&5@60&10
Loose joint.....dis 70
Loose joint, jap.....dis 70
Loose joint, jap. with acorns.....dis 70
Loose pin, acorns.....dis 70
Loose pin, japanned acorns.....dis 70
Loose pin, acorns, jap. plated tips.....dis 70
Wrought steel—
Wrought, fast joint, narrow.....dis 70
Wrought, fast joint, broad.....dis 70
Wrought, loose joint, broad.....dis 70
Table Butts, back flaps, etc.....dis 70
Regular inside blind.....dis 70
Light inside blind.....dis 70
Loose pin.....dis 70
Light loose pin.....dis 70

Chains.

Trace, 6½-10-2.....℔ pair 1.03
Trace, 6½-10-3.....℔ pair .92 } 50&10@50&10&5
Trace, 7-10-2.....℔ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887..dis 50&10&5@60
Galvanized Pump Chain.....℔ 5½@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 70@70&5

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Fibre Ware—Standard.

	Nos. 1	5.	5X.
Pails, water, 12 qt	$4 00	$4 50	$.....
Dairy, 14 qt	4 50	5 00	.....
Fire 12 qt	5 00	.....	.....
Sugar	6 00	6 50	.....
Horse	.....	5 00	.....
Buggy	4 00	.....	.....
Chamber, Slop, Commode } 5 and 5X 14 qt.	6 50	7 50	8 50
Jars, slop, 5 and 5X 14 qt	8 00	9 00	10 00
Basins, wash—			
10½ inch	2 00	2 25	.....
12 inch	2 25	2 75	3 25
13½ inch	2 75	3 25	3 75
15 inch	3 25	3 75	4 25
Bowls, fruit	.....	2 50	.....
Servers, 12 in.	.....	2 25	.....
Baskets, waste paper, 13 in	.....	6 00	.....
Spittons, "Daisy," pressed 8 inch	4 00	4 50	5 00
10 and 11½ inch	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White decorated.

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....℔ gross $12, dis 25@25&5

Hangers.

Barn door, old patterns.....dis 10&10@70
Climax, (Anti-Friction).....dis 70
Star.....dis 40&10@40&10&5
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

No.	10	9	8	7	6	
Ausable, ℔ M.	23	24	25	26	28.	dis 25&10@25&10&10
Putnam, ℔ M.	18	19	20	21	23	dis 15
Essex						dis 25&10@25&10&10

Horse Shoes.

Burden, at factory.....℔ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....℔ keg $4 00
Mule Shoes, at factory.....℔ keg $5 00

Knobs.

Carriage, japanned.....℔ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hemacite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbear, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....℔ gross $4.80

Plumbs and Levels.

Standard list.....dis 70&10@70&10&10
Pocket levels.....dis 70&10@70&10&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@00
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods dis 70&5@70&10&5

Pokes, Animal.

Bishop's I. X. L.....℔ doz $6 00
Bishop's O K.....℔ doz $5 25
Bishop's Pioneer.....℔ doz $3 75
Bishop's American.....℔ doz $2 75

Rakes.

Cast steel.....dis 65&5
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@[illegible]...dis 10
Rifle razor.....dis $9 50 net

Scales.

Hatch, Counter, No. 171.....℔ doz $21 00
Hatch, Tea, No. 161.....℔ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....℔ doz $18 dis 25

Squares.

Steel and iron, Nickel plated } dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, January 2, 1888.
American iron carpet tacks all kinds dis 70&5
Steel carpet tacks all kinds.....dis 70&5
Swedes iron carpet tacks, all kinds.....dis 70&5
Swedes iron tacks.....dis 70&5
Swedes iron Upholsterers' tacks.....dis 70&5
Tinned Swedes iron tacks.....dis 70&5
Tinned Swedes iron Upholsterers' tacks.....dis 70&10
American iron cut tacks.....dis 67½&5
Copper tacks.....dis 50
Copper finishing and trunk nails.....dis 50&00
Cigar box nails.....dis 45&10
Finishing nails.....dis 65
Hungarian nails and miners' tacks.dis 62½&5
Gimp and lace tacks.....dis 70&5
" " " tinned.....dis 66&10
Trunk and clout nails.....dis 66⅔
Tinned trunk&clout nails.....dis 66&10
Basket nails.....dis 66&10
Chair nails.....dis 66&10
Common and patent brads.....dis 66&10
Tinned capped trunk nails.....dis 60

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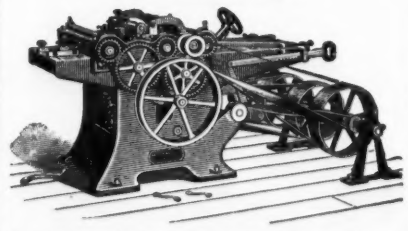

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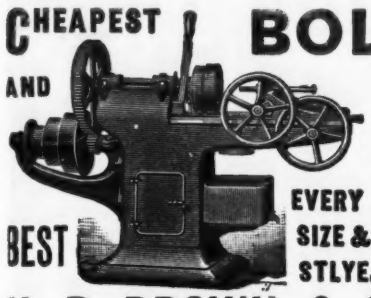

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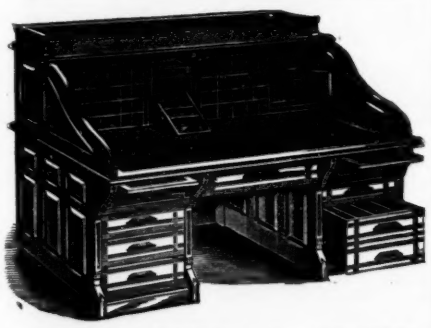

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Standard Time.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express.....	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo.....		†6 40 a m
Pittsburgh Express.....	†6 25 p m	
Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	‡1 20 p m	11 10 p m
New York Express.....	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m.,6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.

Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 45 a m	*6 25 p m
Marietta Express.....	†11 15 a m	†2 25 p m
Valley Junction Express...	*4 15 p m	*10 25 a m
Cleve. and Canton Express	*7 05 p m	†8 20 a m

*Daily. †Daily, except Sunday.

J. T. JOHNSON, Gen. Supt. J. B. CAVEN, Gen. Pass. Agt.

From Cleveland Union Station.

PENNSYLVANIA LINES.

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	8 00 a m	d5 25 a m
	1 05 p m	12 50 p m
	d11 10 p m	6 35 p m
Wheeling and Bellaire.	8 00 a m	12 50 p m
	1 05 p m	6 35 p m
	*11 10 p m	.....
Alliance Accom.	3 25 p m	9 40 a m
Ravenna Accom.	5 00 p m	8 25 a m

d Daily. * Except Saturday. Other trains except Sunday.

From Cleveland Union Station.

Mt Vernon and Pan Handle Route

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest.	8 10 a m	d 7 00 am
	d 8 00 p m	5 40 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Zanesville, Gambier, Mt. Vernon and Columbus.	1 05 p m	12 50 p m
For Cuyahoga Falls, Akron, Orrville, Chicago, and all points in the West and Northwest.	8 10 a m	5 40 p m
	3 25 p m	9 35 a m

d Daily. Other trains except Sunday.

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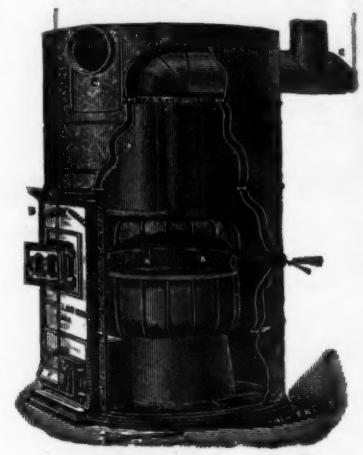

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No. 64, Fast Pittsburgh Express.....	* 3 00 p m
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No. 68, New York Vestibule Limited.	* 8 30 p m
No. 70, Pittsburgh Local Express.....	*11 25 a m
No. 74, Pittsburgh & Youngst'n Ex...	†11 00 p m
	Arrive.
No. 65, Fast New York Express.....	*10 15 a m
No. 61, N. Y. & Pittsburgh Express...	* 7 15 a m
No. 71, Leavittsburg Local.....	† 2 10 p m
No. 67, Pittsburgh Express.....	*12 45 p m
No. 63, New York Express.....	* 6 50 p m
No. 63, Pittsburgh Express.....	* 6 50 p m
No. 69, Pittsburgh Local Express.....	† 9 10 p m
No. 73, Mantua Accommo.....	* 7 20 p m
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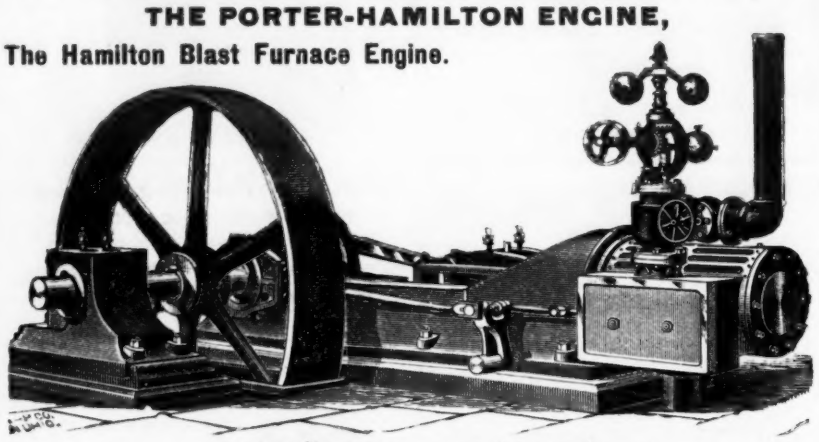

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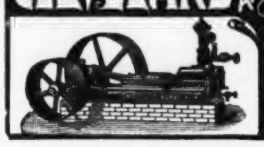

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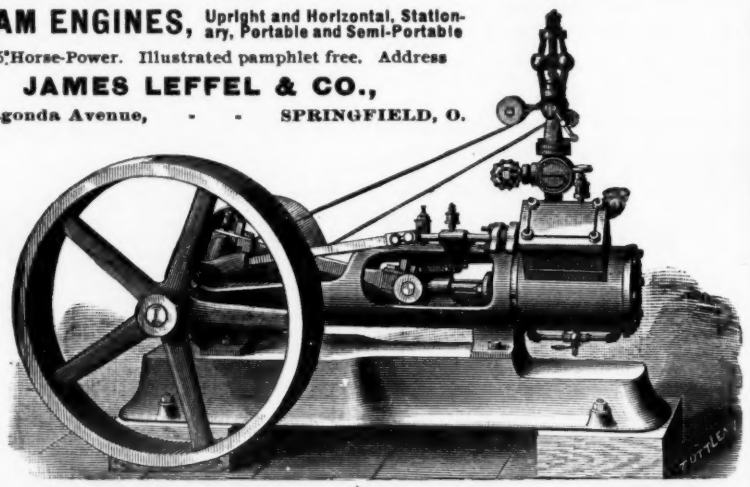

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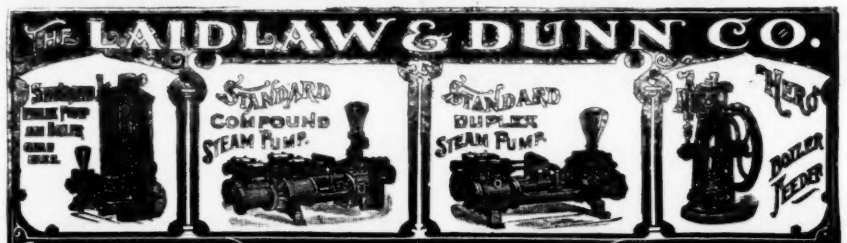

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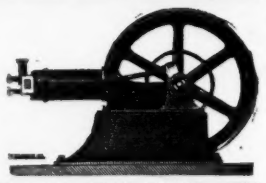

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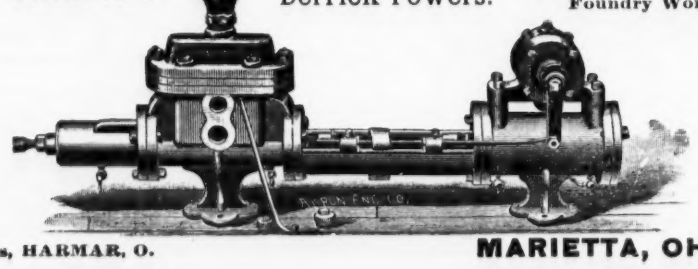

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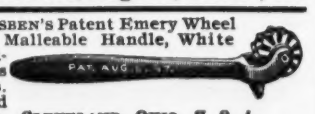

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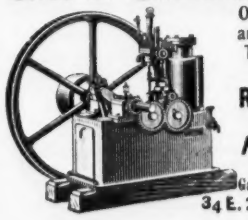

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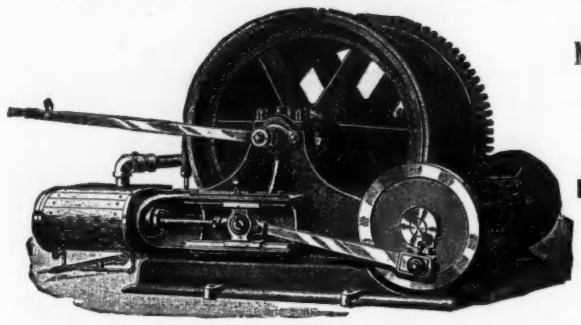

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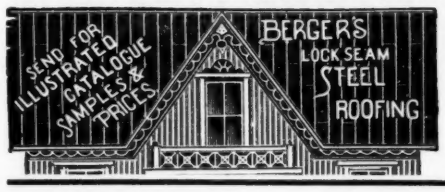

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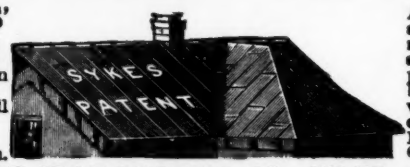

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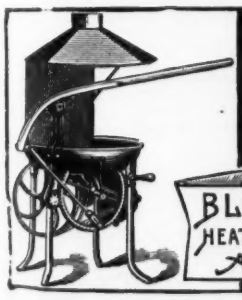

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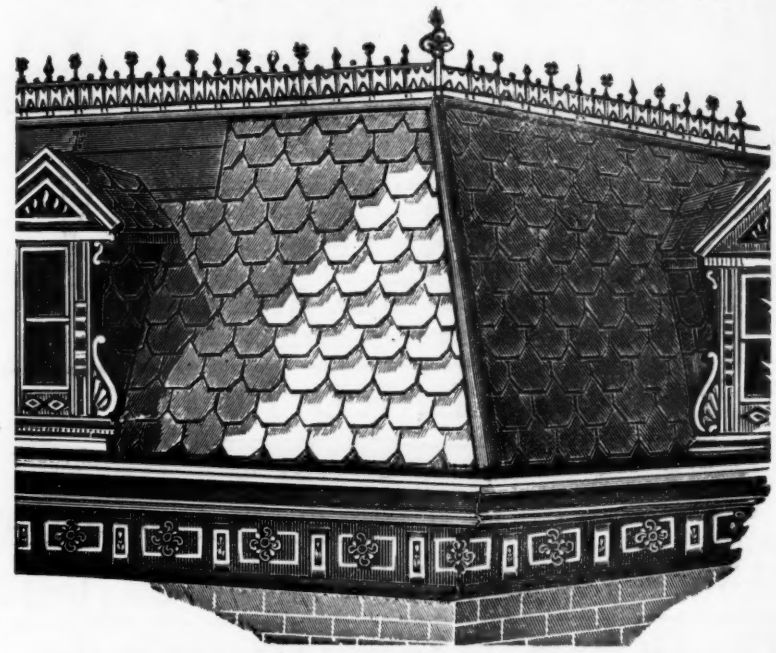

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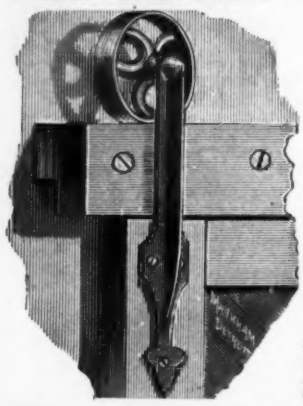

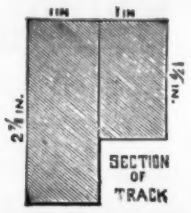

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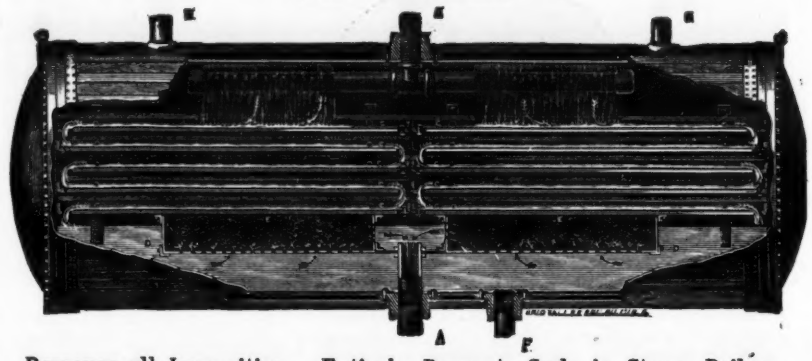

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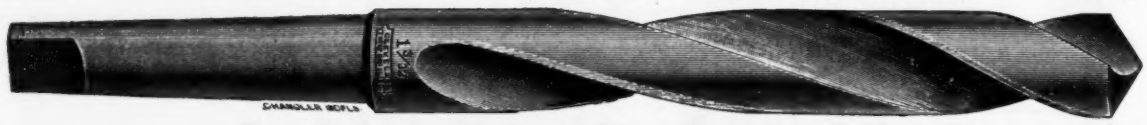

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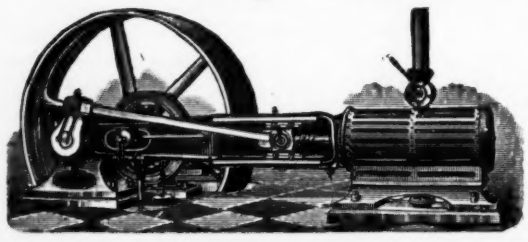

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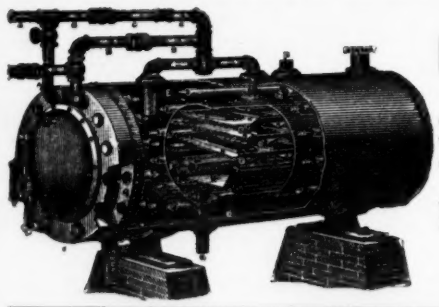

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Purifies the feed water by means of the live steam, and heats the water up to the boiling point by means of exhaust steam.

A full description of this heater, together with a valuable treatise on steam boilers, sent to any address free of charge. Address,

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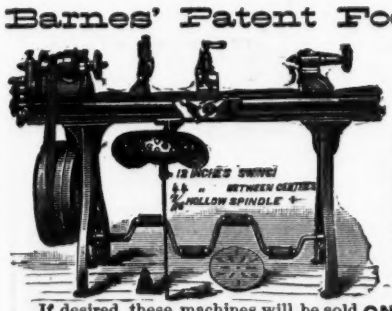

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Our Patent Velocipede Foot-Power is without question the best yet applied to Lathes. Read a few expressions from those using them: "I do not see how your lathes can be produced at so low cost." "The velocipede foot-power is simply elegant." "Can turn a whole day, and feel as little tired as though only walking around." "In regard to the velocipede foot-power, I consider the lathe without an equal." "I sat at the lathe for 11 hours, cutting off and threading 1¼ steam pipes. Those who saw it declared it equal to 15 hour job in machine shop." "Using the velocipede foot-power, the operator can hold a steady hand for doing the work." "For doing actual business, the lightest or the heaviest, give me the velocipede foot-power." "The 4½ Lathe is equal to any costing twice the money." "What astonishes me is, how you can make machines to pay you for so small sum of money." "The No. 6 Lathe is the most perfect tool I ever saw for the money." "I can do double the amount of work on the velocipede, that I can on any other style of foot-power lathe." "There is no tax on strength, the body is at rest, steady, the hands and attention free for the job." "The velocipede.—It is the best foot-power of any for lathes."

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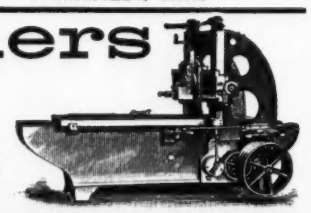
24″, 26″, 32″, 36″, 42″ and 56″.

Any length of bed. Address



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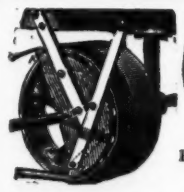

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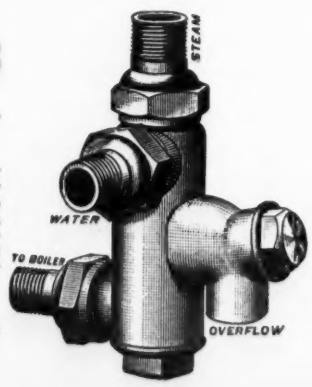

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